Study groups	Rabbit no.	DNA priming (4 X)		Protein boost (2 X)	
		gp120 immunogens	Doses (mg)	gp120 immunogens	Doses (mg)
Mono-valent	R101, R102, R103	Bal	36	Bal	100
	R104, R105	B	36	B	100
	R106, R107, R108	C1	36	C1	100
	R109, R110, R111	E	36	E	100
3-valent	R301, R302, R303	B, C1, E	36 (12 μg each DNA)	B, C1, E	100 (33.3 μg each protein)
8-valent	R801, R802, R803	A, B, C1, D, E, F, G, Bal	40 (5 μg each DNA)	B, C1, E, Bal	100 (25 μg each protein)
Control	R001, R002	None (Vector control)	36	B, C1, E, Bal	100 (25 μg each protein)

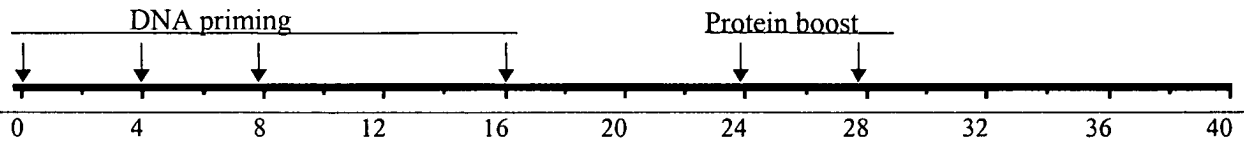


FIG. 1

Neutralization against HIV-1 primary isolates from clades A, B, C and E after last DNA immunization

Study groups	Animal no.	Clade B				Clade C			Clade A	Clade E	
		ADA	SF162	Bal	JRCSF	TV1	DU151	S007	DJ263	CM235	CM244
Mono-valent	R101	0.0	34.2	10.9	21.2	0.0	0.0	40.0	0.0	0.0	0.0
	R102	0.0	37.9	11.3	12.1	0.0	6.0	0.0	0.0	0.0	0.0
	R104	16.0	76.0	15.0	34.0	43.6	0.0	13.8	44.9	0.0	0.0
	R105	4.0	55.0	15.0	46.0	27.1	8.2	0.0	4.0	0.0	0.0
	R106	16.9	59.6	4.0	30.0	31.6	17.6	11.3	39.0	0.0	2.4
	R107	1.8	47.9	5.8	21.5	22.5	0.0	0.6	21.3	0.0	2.4
	R109	0.0	38.6	0.0	18.9	14.2	33.8	0.0	32.0	0.0	29.9
	R110	8.9	46.6	0.0	0.0	16.9	0.0	21.1	12.2	0.0	19.7
Poly-valent	R301	0.0	71.8	17.9	45.6	0.0	0.0	0.0	0.0	0.0	0.0
	R302	0.0	42.1	0.0	16.3	14.0	0.0	39.0	0.0	0.0	0.0
	R801	0.0	63.5	5.2	40.7	26.0	1.0	0.0	3.0	0.0	0.0
	R802	0.0	34.8	0.0	0.0	31.0	0.0	10.0	28.0	0.0	0.0
Control	R001	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	6.0
Positive antibodies	Concentration										
HIVIG	10 mg/ml	96.8	99.1	98.9	98.8	98.1	96.4	100.1	98.4	95.3	98.1
	1 mg/ml	44.6	95.6	84.1	83.1	19.0	58.6	69.9	75.0	29.3	35.2
2F5	50 µg/ml	74.9	92.9	86.7	93.2	76.5	29.0	39.2	27.9	91.2	86.4
	5 µg/ml	43.4	67.8	52.6	76.4	29.0	16.6	17.5	10.8	65.2	61.4
2G12	50 µg/ml	32.7	59.2	75.9	77.9	28.2	5.5	2.3	90.1	4.7	0.0
	5 µg/ml	20.3	43.6	53.3	57.9	15.7	16.0	9.0	77.0	0.0	6.0

FIG. 2

Neutralization against HIV-1 primary isolates from clades A, B, C and E after the first protein boost

Study groups	Animal no.	Clade B				Clade C			Clade A	Clade E	
		ADA	SF162	Bal	JRCSF	TV1	DU151	S007	DJ263	CM235	CM244
Mono-valent	R101	0.0	80.4	58.9	70.4	21.0	0.0	47.0	24.0	0.0	0.0
	R102	0.0	74.6	63.9	57.0	14.0	0.0	0.0	0.0	0.0	0.0
	R104	31.5	95.0	81.0	69.0	59.7	0.0	5.4	57.7	0.0	0.0
	R105	6.0	46.5	88.0	84.0	81.2	0.0	0.0	41.5	0.0	0.0
	R106	10.8	47.4	31.1	30.0	20.4	15.4	27.5	42.7	0.0	0.0
	R107	2.7	54.0	0.0	6.2	39.5	0.0	7.0	16.7	0.0	26.2
	R109	13.0	35.1	0.0	19.7	40.3	1.3	0.0	44.4	0.0	8.5
	R110	10.5	31.9	0.0	0.0	34.8	4.9	34.3	36.5	0.0	28.4
Poly-valent	R301	11.5	93.6	93.6	90.5	89.0	23.0	0.0	14.0	0.0	0.0
	R302	0.0	91.5	79.6	84.2	87.0	33.0	54.0	55.0	0.0	27.0
	R801	0.0	84.8	61.6	73.9	68.0	23.0	31.0	36.0	0.0	0.0
	R802	0.0	73.0	13.5	41.4	74.0	0.0	13.0	65.0	0.0	0.0
Control	R001	0.0	33.5	0.2	24.1	0.0	0.0	36.0	0.0	0.0	6.0
Positive antibodies	Concentration										
HIVIG	10 mg/ml	96.8	99.1	98.9	98.8	98.1	96.4	100.1	98.4	95.3	98.1
	1 mg/ml	44.6	95.6	84.1	83.1	19	58.6	69.9	75	29.3	35.2
2F5	50 µg/ml	74.9	92.9	86.7	93.2	76.5	29	39.2	27.9	91.2	86.4
	5 µg/ml	43.4	67.8	52.6	76.4	29	16.6	17.5	10.8	65.2	61.4
2G12	50 µg/ml	32.7	59.2	75.9	77.9	28.2	5.5	2.3	90.1	4.7	0
	5 µg/ml	20.3	43.6	53.3	57.9	15.7	16	9	77	0	6

FIG. 3

Neutralization against HIV-1 primary isolates from clades A, B, C and E after the second protein boost

Study groups	Animal no.	Clade B				Clade C			Clade A	Clade E	
		ADA	SF162	Bal	JRCSF	TV1	DU151	S007	DJ263	CM235	CM244
Mono-valent	R101	0.0	89.5	70.0	67.9	0.0	0.0	0.0	22.0	0.0	27.7
	R102	1.0	77.3	56.0	49.4	52.8	0.0	0.0	56.4	0.0	17.0
	R104	33.5	94.0	87.0	79.0	80.0	22.8	33.0	65.7	0.0	0.0
	R105	37.0	92.0	84.0	84.0	81.9	34.9	0.0	49.5	0.0	0.0
	R106	35.1	92.6	82.1	80.7	79.9	54.1	62.5	79.8	25.5	33.4
	R107	26.1	92.1	76.6	82.3	90.0	0.0	66.8	68.5	0.0	45.3
	R109	37.2	88.9	44.9	48.5	76.8	0.0	3.4	68.2	0.0	0.0
	R110	11.3	26.3	0.0	52.6	77.6	43.7	59.1	70.0	0.0	28.4
Poly-valent	R301	24.0	94.7	81.2	82.6	79.2	8.7	39.0	70.2	10.9	33.4
	R302	13.0	93.2	75.2	67.1	47.3	0.0	44.0	64.0	16.1	23.7
	R801	24.0	91.4	74.9	79.7	72.9	0.0	42.4	62.5	3.3	32.5
	R802	29.0	89.3	69.5	73.8	83.8	1.2	3.7	79.7	15.2	37.6
Control	R001	0.0	40.6	23.7	35.4	50.1	0.0	0.0	22.0	0.0	0.0
Positive antibodies	Concentration										
HIVIG	10 mg/ml	96.8	99.1	98.9	98.8	98.1	96.4	100.1	98.4	95.3	98.1
	1 mg/ml	44.6	95.6	84.1	83.1	19.0	58.6	69.9	75.0	29.3	35.2
2F5	50 µg/ml	74.9	92.9	86.7	93.2	76.5	29.0	39.2	27.9	91.2	86.4
	5 µg/ml	43.4	67.8	52.6	76.4	29.0	16.6	17.5	10.8	65.2	61.4
2G12	50 µg/ml	32.7	59.2	75.9	77.9	28.2	5.5	2.3	90.1	4.7	0.0
	5 µg/ml	20.3	43.6	53.3	57.9	15.7	16.0	9.0	77.0	0.0	6.0

FIG. 4

Neutralization of HIV-1 clade B viruses

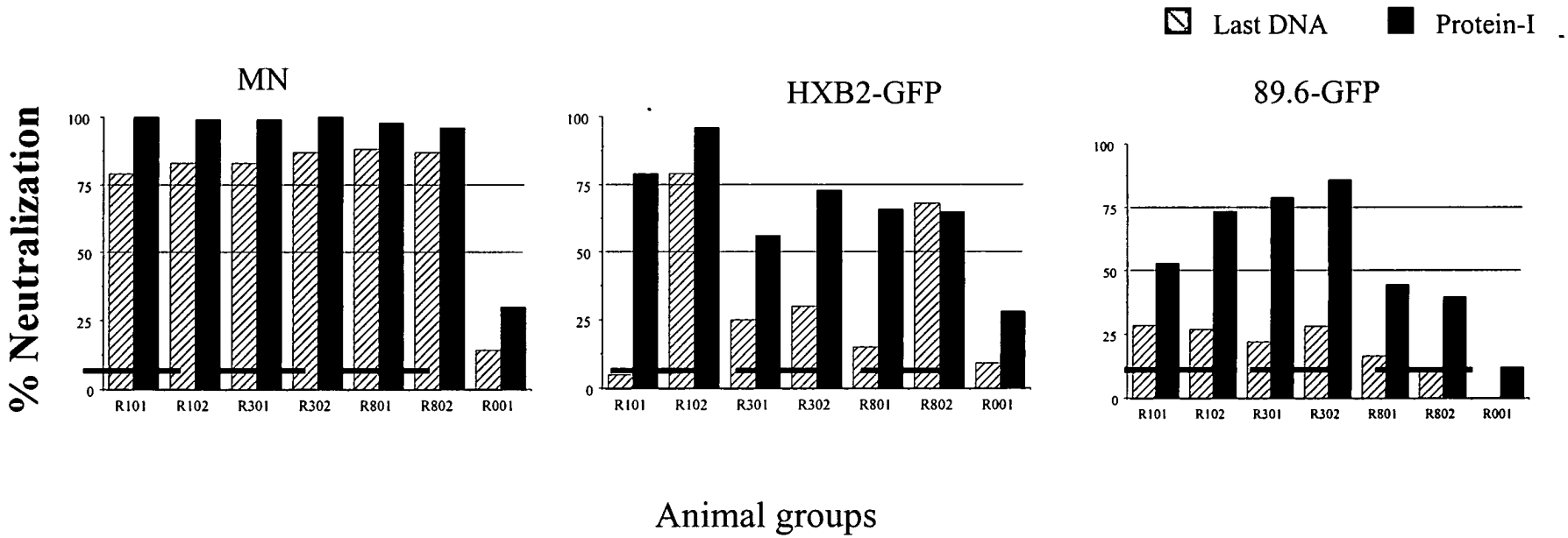


FIG. 5A

FIG. 5B

FIG. 5C

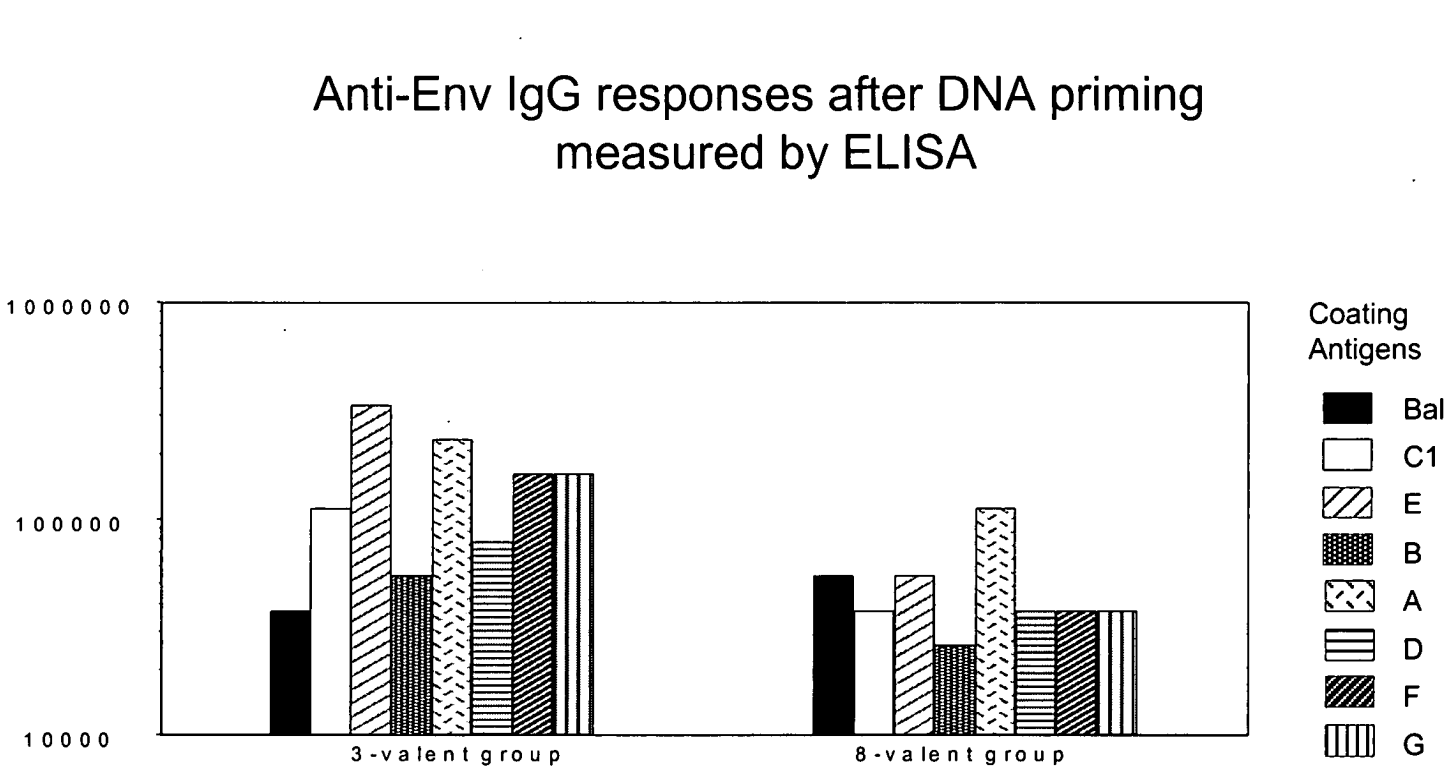
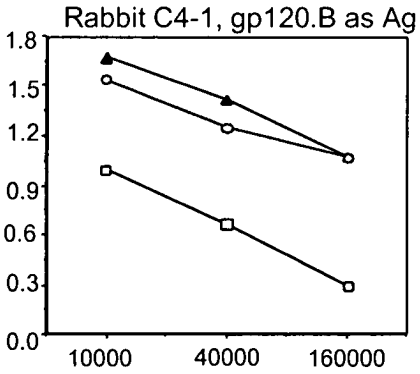

Anti-Env IgG responses after DNA priming
measured by ELISA
1000000
100000
10000
3-valent group
8-valent group
Coating
Antigens
Bal
C1
E
B
A
D
F
G

FIG. 6

FIG. 7A



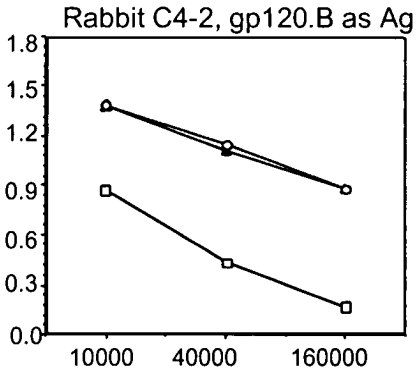
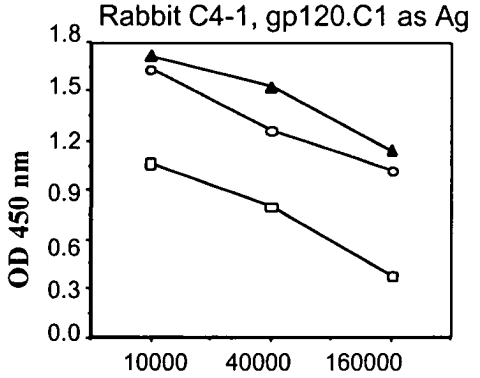
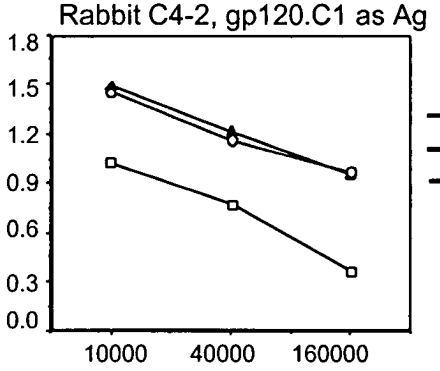


FIG. 7B

FIG. 7C





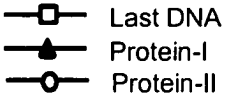
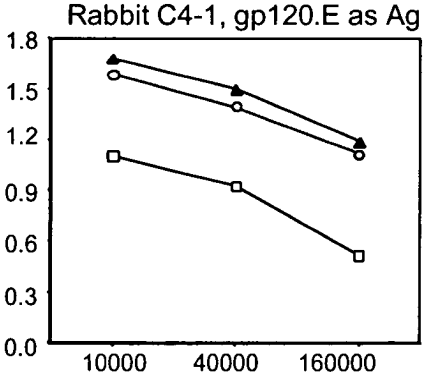
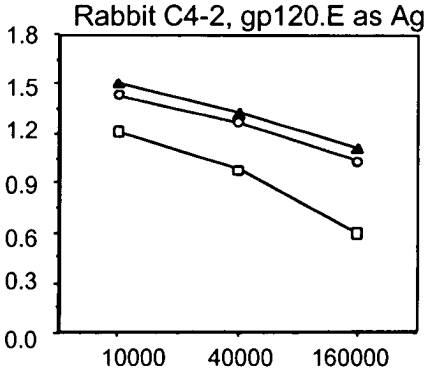


FIG. 7D

FIG. 7E





Serum Dilution

FIG. 7F

FIG. 8A

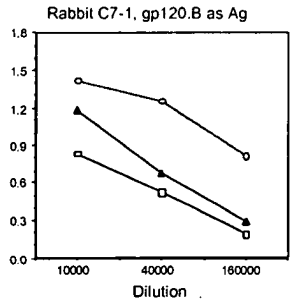


FIG. 8B

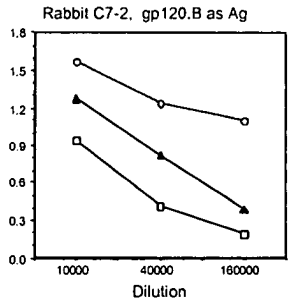


FIG. 8C

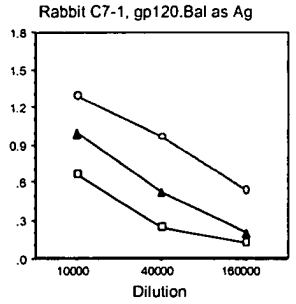
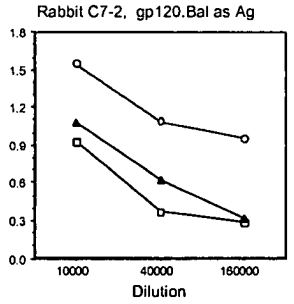
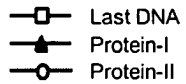


FIG. 8D





OD 450 nm

FIG. 8E

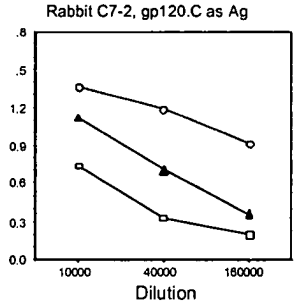


FIG. 8F

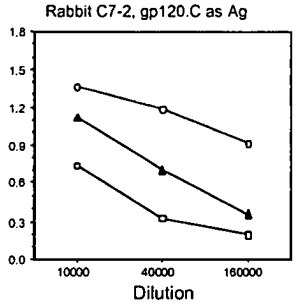


FIG. 8G

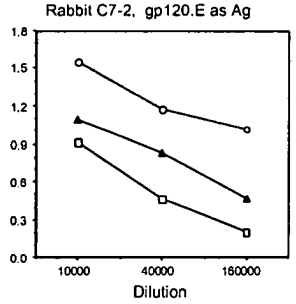


FIG. 8H

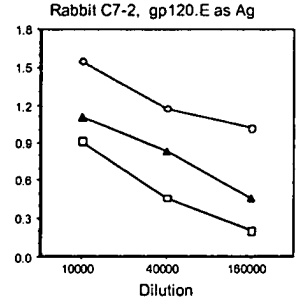


FIG. 8I

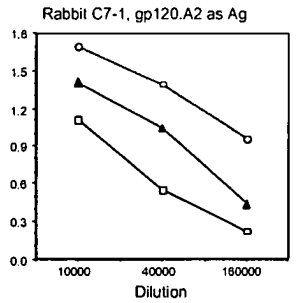


FIG. 8J

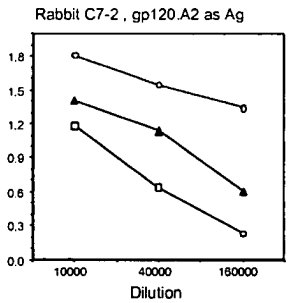


FIG. 8K

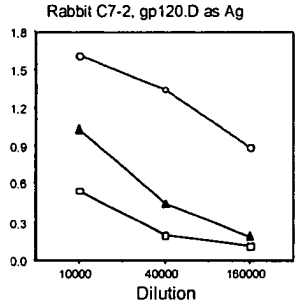
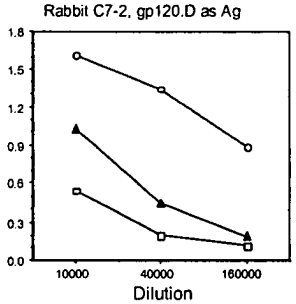
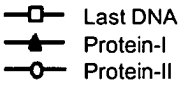


FIG. 8L





OD 450 nm

FIG. 8M

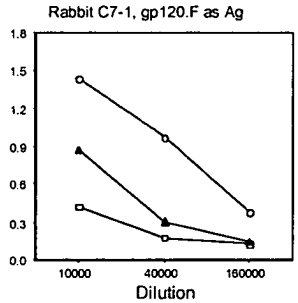


FIG. 8N

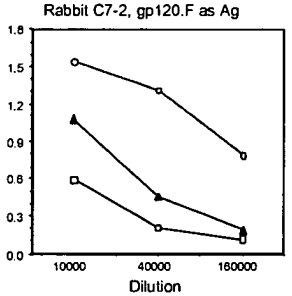


FIG. 8O

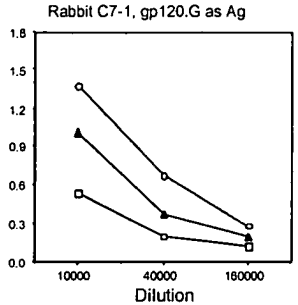
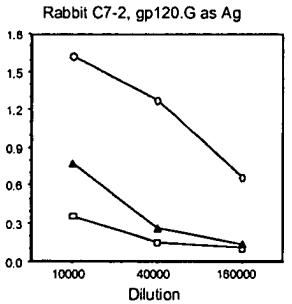


FIG. 8P



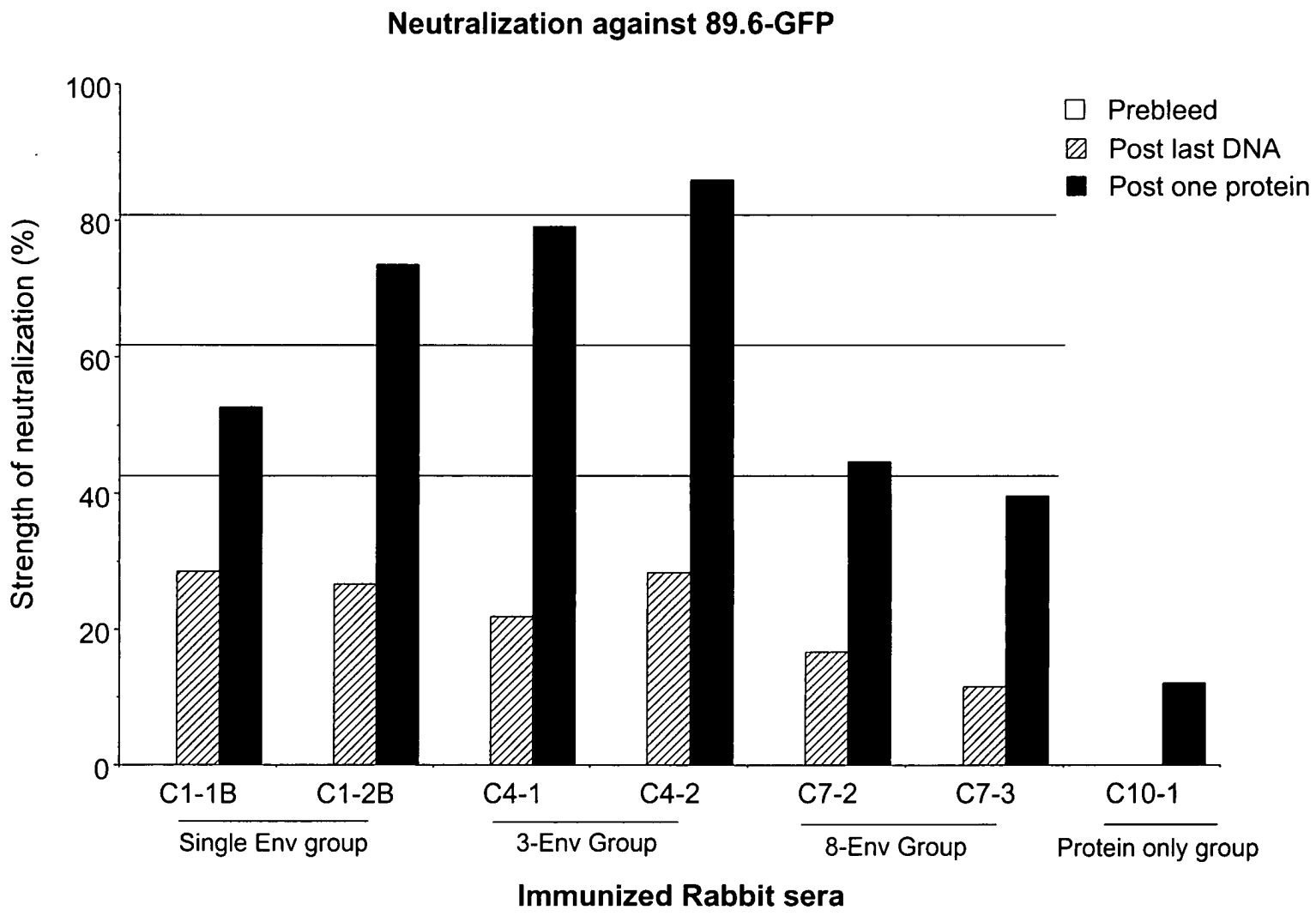

Neutralization against 89.6-GFP
Prebleed
Post last DNA
Post one protein
Strength of neutralization (%)
100
80
60
40
20
0
C1-1B
C1-2B
C4-1
C4-2
C7-2
C7-3
C10-1
Single Env group
3-Env Group
8-Env Group
Protein only group
Immunized Rabbit sera

FIG. 9

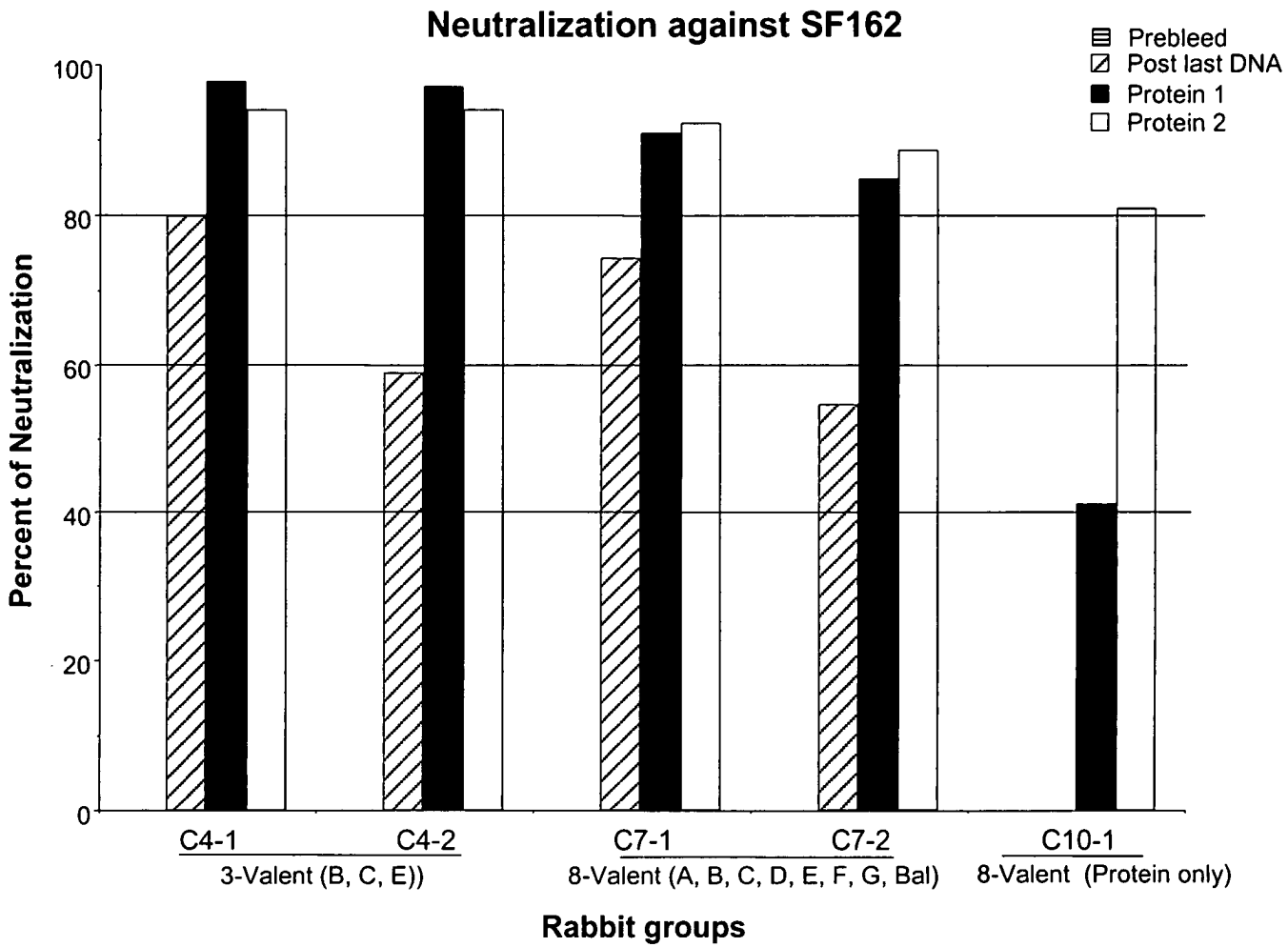

Neutralization against SF162
Prebleed
Post last DNA
Protein 1
Protein 2
Percent of Neutralization
100
80
60
40
20
0
C4-1
C4-2
C7-1
C7-2
C10-1
3-Valent (B, C, E))
8-Valent (A, B, C, D, E, F, G, Bal)
8-Valent (Protein only)
Rabbit groups

FIG. 10

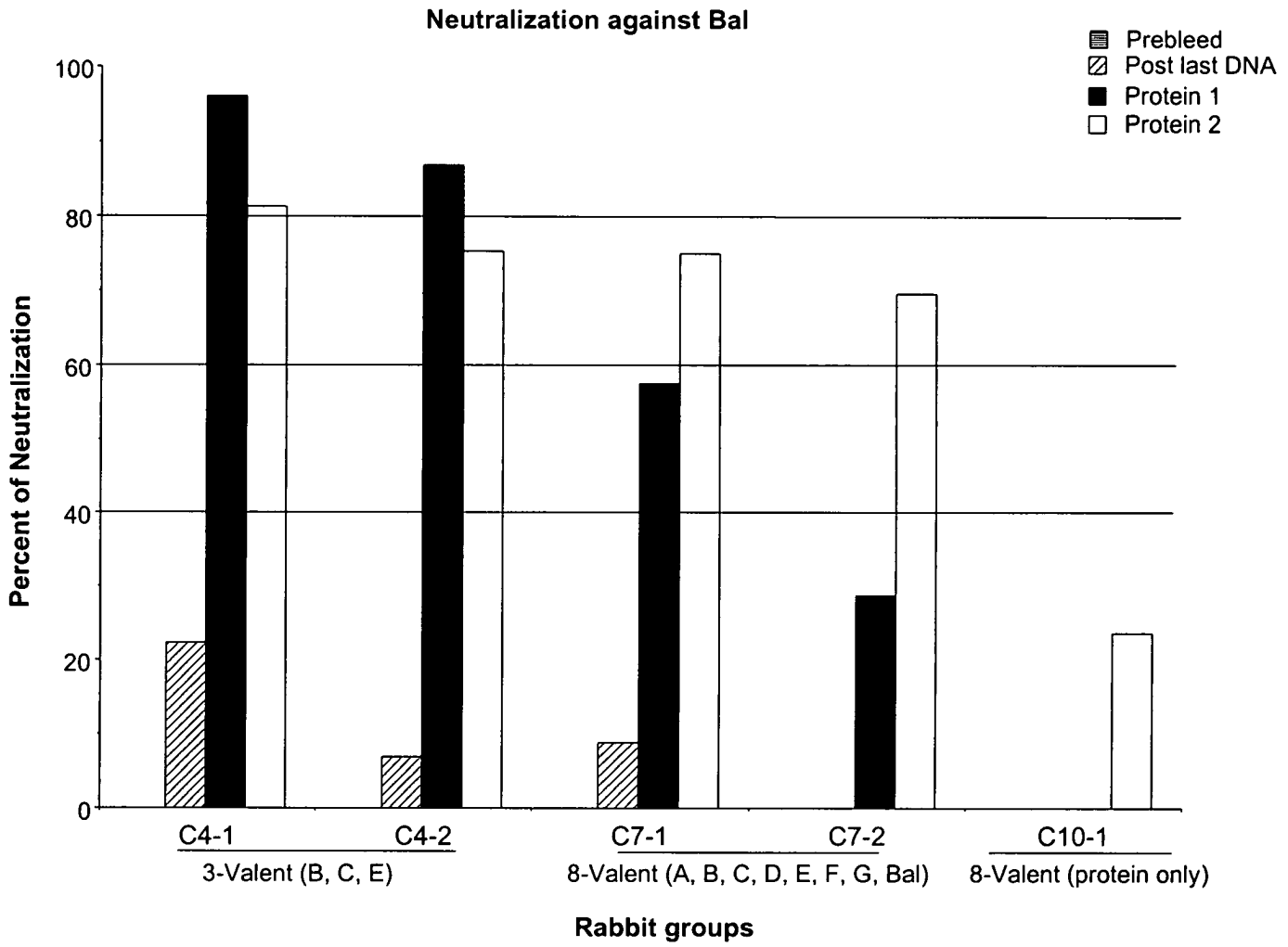

Neutralization against Bal
Prebleed
Post last DNA
Protein 1
Protein 2
Percent of Neutralization
100
80
60
40
20
0
C4-1
C4-2
C7-1
C7-2
C10-1
3-Valent (B, C, E)
8-Valent (A, B, C, D, E, F, G, Bal)
8-Valent (protein only)
Rabbit groups

FIG. 11

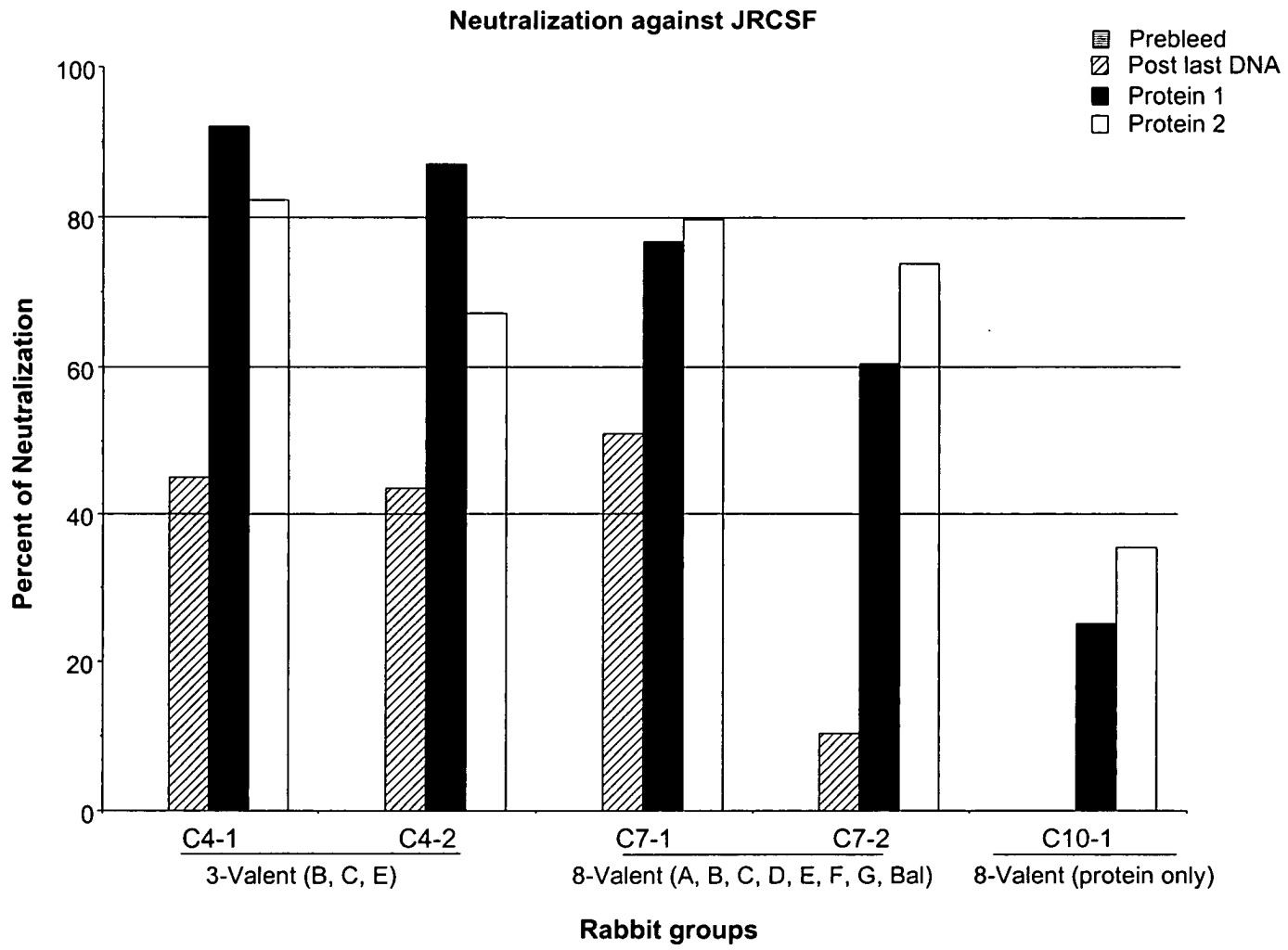

Neutralization against JRCSF
Prebleed
Post last DNA
Protein 1
Protein 2
Percent of Neutralization
100
80
60
40
20
0
C4-1
C4-2
C7-1
C7-2
C10-1
3-Valent (B, C, E)
8-Valent (A, B, C, D, E, F, G, Bal)
8-Valent (protein only)
Rabbit groups

FIG. 12

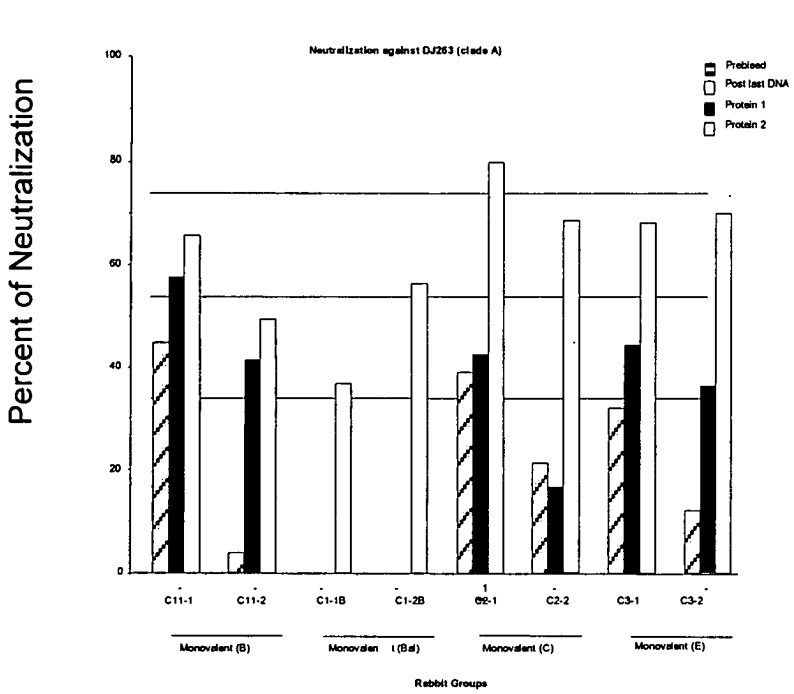


FIG. 13A

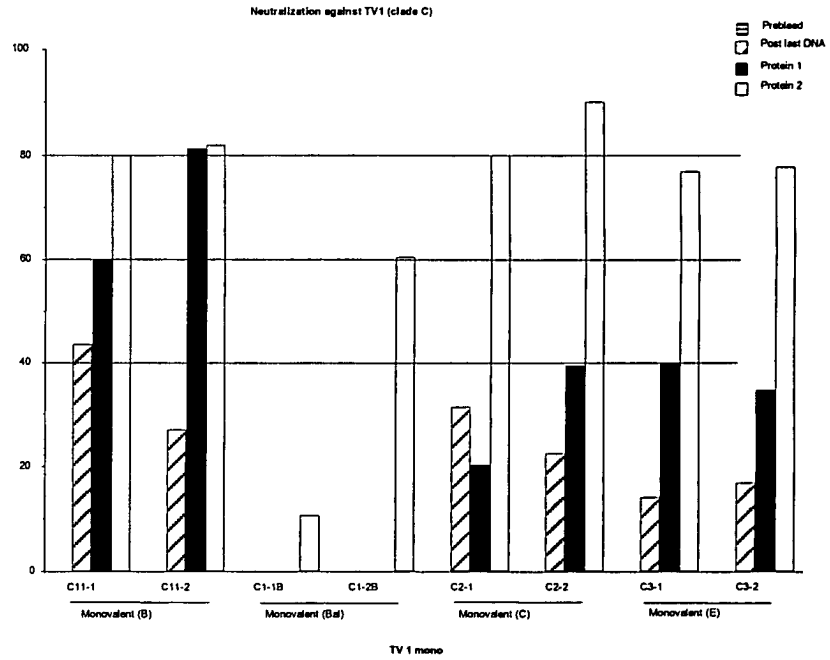


FIG. 13B

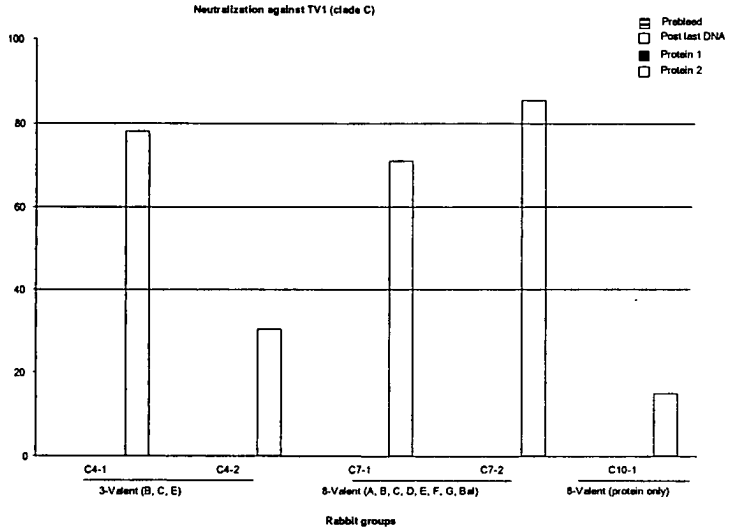


FIG. 13C

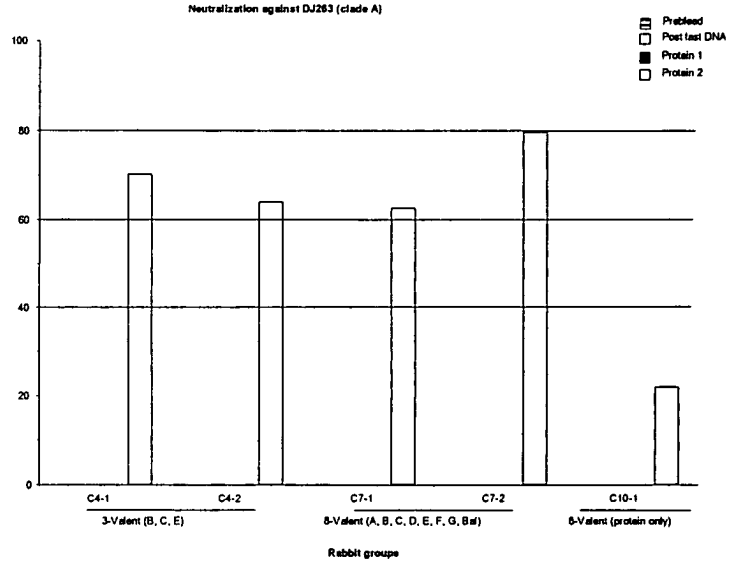


FIG. 13D

```
A gp120       1 ---SLWVTVYYGVPVWKDAETTLFCASDAKAYDTEVHNVWATHACVPTDPNPQEIAMENVTEEFNMWKNNMVEQMHTDII
Ba-L gp120    1 ---SLWVTVYYGVPVWKEATTTLFCASDRKAYDTEVHNVWATHACVPTDPNPQEVVLKNVTENFNMWKNNMVEQMHEDII
B715 gp120    1 ---SLWVTVYYGVPVWKEANTTLFCASDAKAYDTEVHNVWATHACVPTDPSPQEVVLENVTENFNMWKNNMVEQMHEDII
Czm gp120     1 SNGNLWVTVYYGVPVWKEAKTTLFCASDAKSYEKEVHNVWATHACVPTDPNPQEIVLGNVTENFNMWKNDMVDQMHEDII
E gp120       1 ---SLWVTVYYGVPVWKDADTTLFCASDAKAHETEVHNVWATHACVPTDPNPQEIHLENVTENFNMWKNKMVEQMQEDVI

A gp120      78 SLWDQSLKPCVQLTPLCVTLDCS----ENNITN-NITNSITNSSVNMREEIKNCSFNMTTELRDKNRKVYSLFYKLDV
Ba-L gp120   78 SLWDQSLKPCVKLTPLCVTLNCTDLR-NATNG---NDTNTTSSSRGMVGGGEMKNCSFNITTNIRGKVQKEYALFYKLDI
B715 gp120   78 SLWDQSLKPCVKLTPLCVTLNCTNLR-NDTNTTR-NATNTTSSET-MMEEGEIKNCSFNITTSIRDKVQKEYALFYKLDV
Czm gp120    81 SLWDQSLKPCVKLTPLCVTLNCTEVN-VTRNVNN-SVVNNTTNVNNSMN-GDMKNCSFNITTELKDKKKNVYALFYKLDI
E gp120      78 SLWDQSLKPCVKLTPLCVTLTCTNATLNCTNLTNGNKTTNVSNIIGNLTD-EVRNCSFNMTTELRDKKQKVYALFYKLDI

A gp120     150 VQINNGN-----NSSNEYRLINCNTSALTQACPKVTFEPIPIHYCAPAGYAILKCNDKEFNGTGLCKNVSTVQCTHGIRP
Ba-L gp120  154 APID--N-----NSNNRYRLISCNTSVITQACPKVSFEPIPIHYCAPAGFAILKCKDKKFNGKGPCTNVSTVQCTHGIRP
B715 gp120   155 VPIE--N-----DETS-YRLISCNTSVLTQACPKVSFEPIPIHFCAPAGFAILKCKDKKFNGTGPCTNVSTVQCTHGIKP
Czm gp120   158 VSLNETDDSETGNSSKYYRLINCNTSALTQACPKVSFDPIPIHYCAPAGYAILKCNNKTFNGTGPCHNVSTVQCTHGIKP
E gp120     157 VQIN--S-----NSSEYRLINCNTSVIKQACPKVSFDPIPIHYCTPAGYAILKCNDKNFNGTGPCKNVSSVQCTHGIKP

A gp120     225 VVSTQLLLNGSLAEGKVMIRSENITNNVKNIIVQLNETVTINCTRPNNNTRKSVRIGPGQTFYATGDIIGDIRQAHCNVS
Ba-L gp120  227 VVSTQLLLNGSLAEEEVVIRSANFADNAKVIIVQLNESVEINCTRPNNNTRKSIHIGPGRAFYTTGEIIGDIRQAHCNIS
B715 gp120   227 VVSTQLLLNGSLAEEEVVIRSANLSDNAKTIIVQLNESVQMNCTRPNNNTRKSIHIGPGRAFYTTGEIIGDIRQAHCNLS
Czm gp120   238 VVSTQLLLNGSLAEEGIIIRSENLTNNVKTIIVHLNRSIEIVCVRPNNNTRQSIRIGPGQTFYATGDIIGDIRQAHCNIS
E gp120     227 VVSTQLLLNGSLAEEEIIRISSENLTNNAKTIIVHLNKSVEISCTRPSNNTRTSIRIGPGQVFYRTGDITGDIRKAYCEIN

A gp120     305 GSQWNRALHQVVGQLREYW-NITIEFKNSSGGDLEITTHSFNCGGEFFYCNTSGLFNSNWTHNDTASMK-PNDTITLPCR
Ba-L gp120  307 RAKWNDTLNKIVIKLREQFGNKTIVFKHSSGGDPEIVTHSFNCGGEFFYCNSTQLFNSTWNVTEESNNTVENNTITLPCR
B715 gp120   307 RTKWNETLKRIVIKLREQYENKTIVFNQSSGGDPEIVMLSFNCGGEFFYCNSTKLFNSTWNGT-ESNNT-GDDPIVLPCR
Czm gp120   318 RTNWTKTLREVRNKLREHFPNKNITFKPSSGGDLEITTHSFNCRGEFFYCNTSGLFSINYT---ENNT-DGTRITLPCR
E gp120     307 ETKWNEALKQVAGKLKEHF-NKTIIFQPPSGGDLEITMHHFNCRGEFFYCDTTQLFNRTWG---ENETREGRNITLPCK

A gp120     383 IKQIINMWQRVGQAIYAPPIQGVIRCESNITGLILTRDGGSNI---NESQIFRPGGGDMRDNWRSELYKYKVVRIEPLG
Ba-L gp120  387 IKQIINMWQEVGRAMYAPPIRGQIRCSSNITGLLLTRDGGP--E--DNKTEVFRPGGGDMRDNWRSELYKYKVVKIEPLG
B715 gp120   385 IKQVINMWQEVGKAMYAPPIRGQIRCSSNITGLLLTRDGGNSND--TNETEIFRPGGGNMKDNWRSELYKYKVVRIEPLG
Czm gp120   393 IRQIINMWQEVGRAMYAPPIEGNIACKSDITGLLLVRDGGSTNDSTNNNTEIFRPAGGDMRDNWRSELYKYKVVEIKPLG
E gp120     382 IKQIVNMWQGAGQAMYAPPISGKIKCVSNITGILLTRDGGANN---SSSETFRPGGGNIKDNWRSELYKYKVVQIEPLG

A gp120     459 VAPTKAKRRVVQ---- (SEQ ID NO:17)
Ba-L gp120  463 VAPTKAKRRVVQ---- (SEQ ID NO:18)
B715 gp120  463 IAPTRAKRRVVQ---- (SEQ ID NO:19)
Czm gp120   473 IAPTEAKRRVVEREKR (SEQ ID NO:20)
E gp120     458 IAPTRAKRRVVQ---- (SEQ ID NO:21)
```

FIG. 14

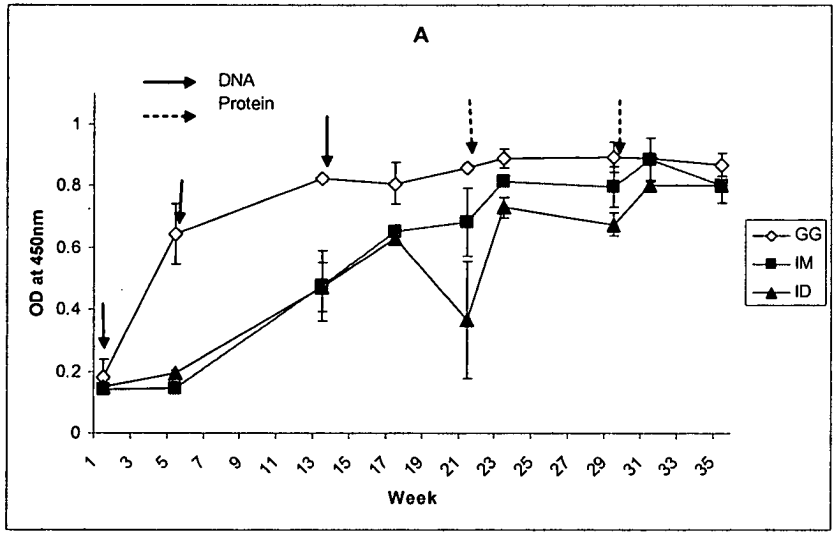


FIG. 15A

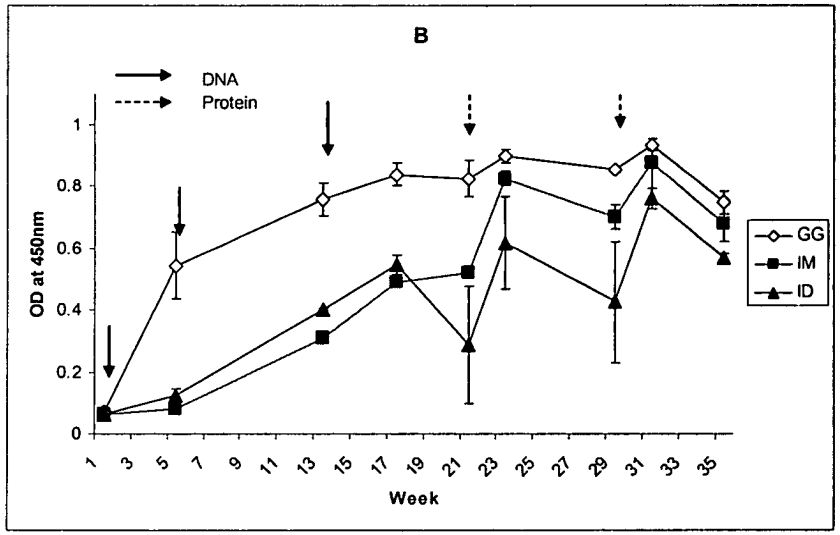


FIG. 15B

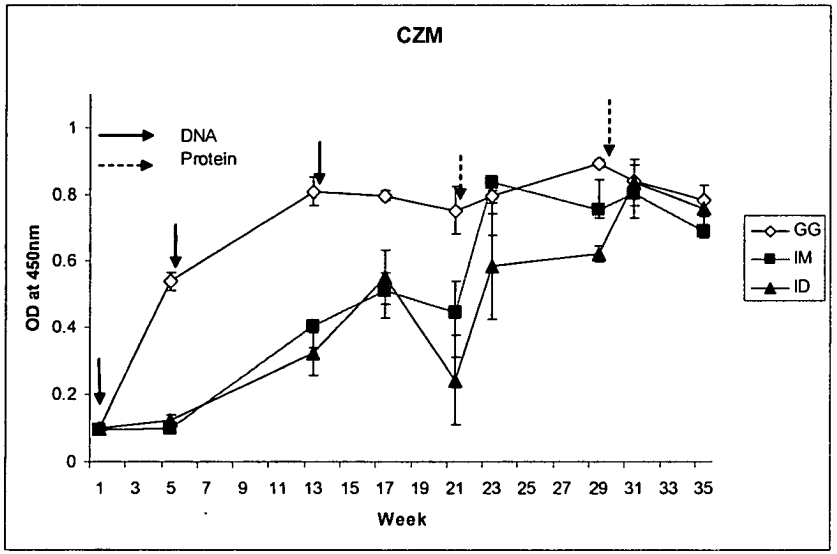


FIG. 15C

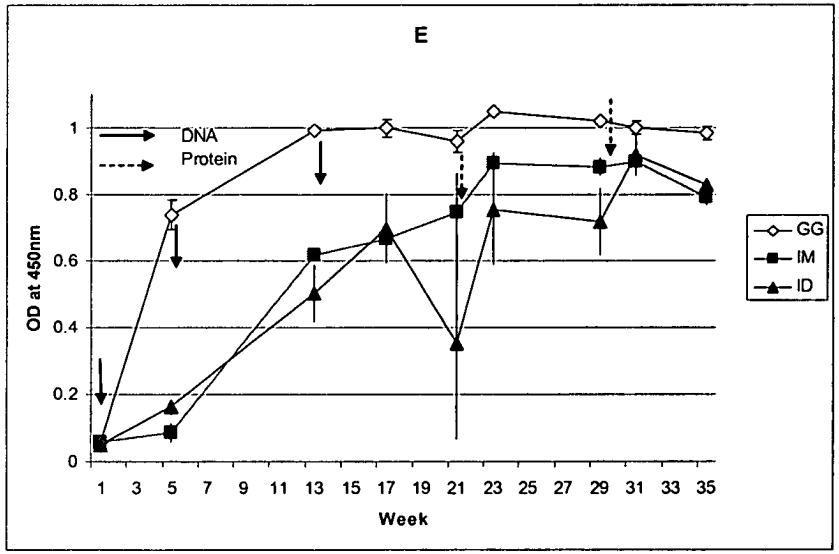


FIG. 15D

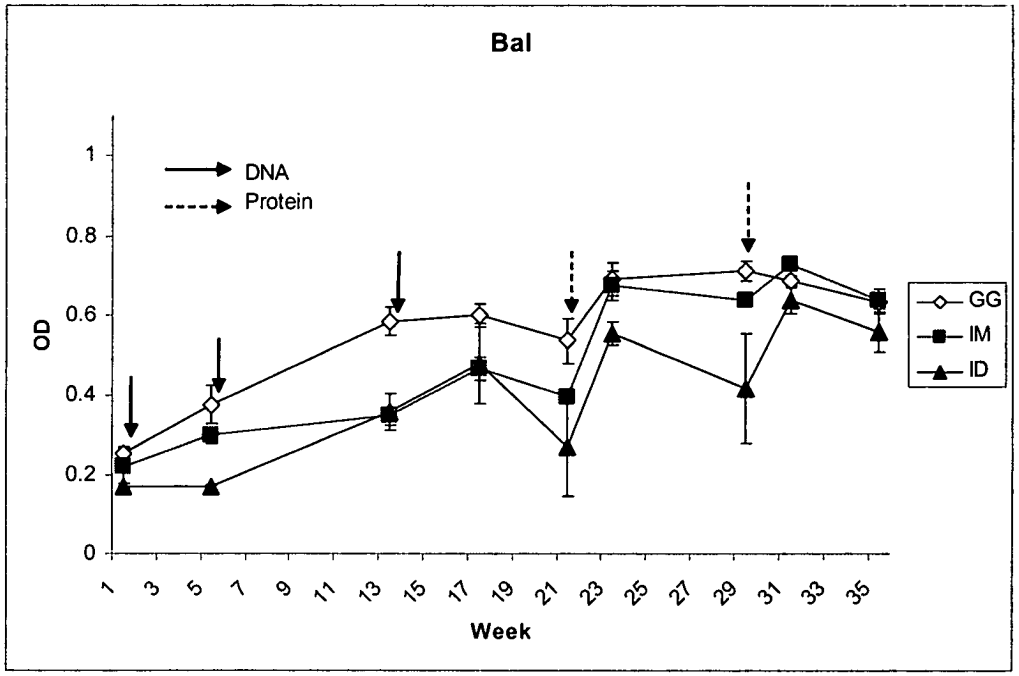

Bal
DNA
Protein
OD
1
0.8
0.6
0.4
0.2
0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
Week
GG
IM
ID

FIG. 15E

Anti-gp120 response in rabbits immunized intramuscularly with DP6-001

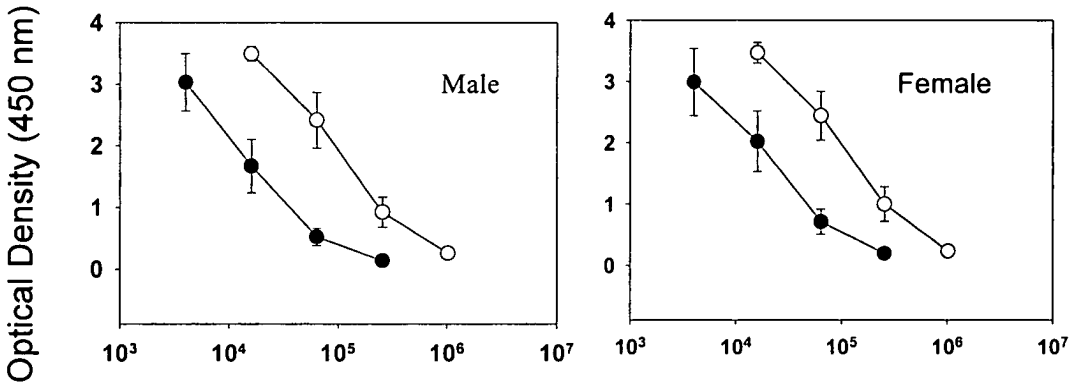


FIG. 16A

FIG. 16B

Anti-gp120 response in rabbits immunized intradermally with DP6-001

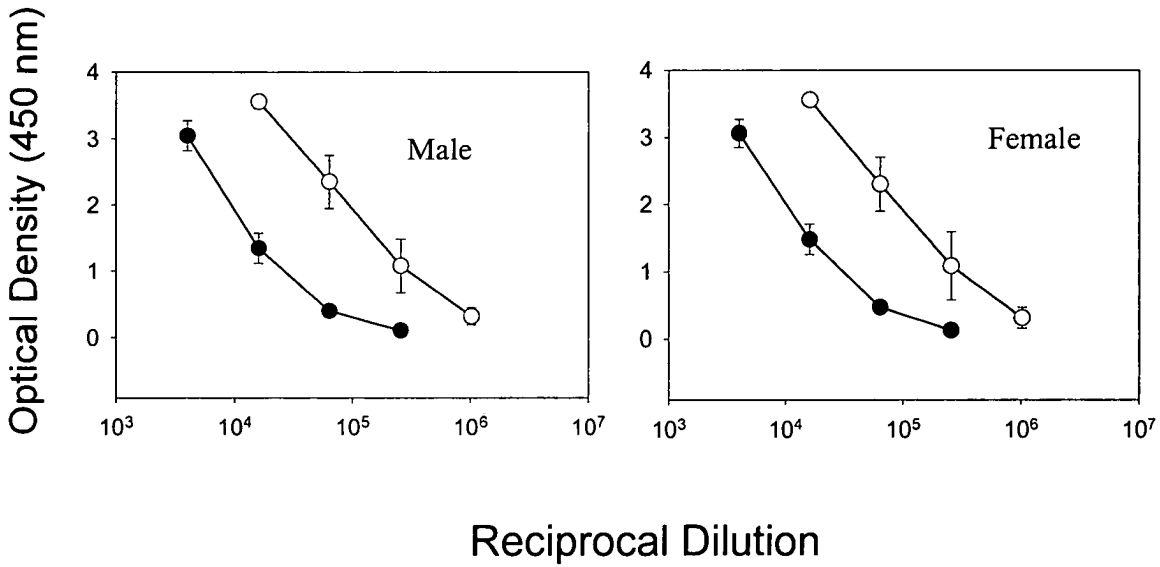


FIG. 17A

FIG. 17B

Anti-gag response in rabbits immunized intramuscularly with DP6-001

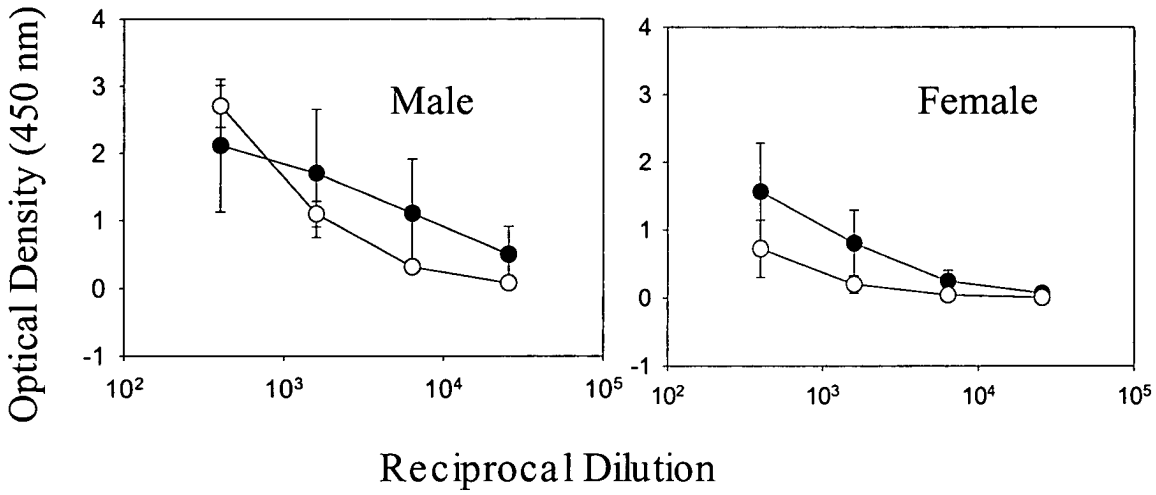


FIG. 18A

FIG. 18B

Anti-gag response in rabbits immunized intradermally with DP6-001

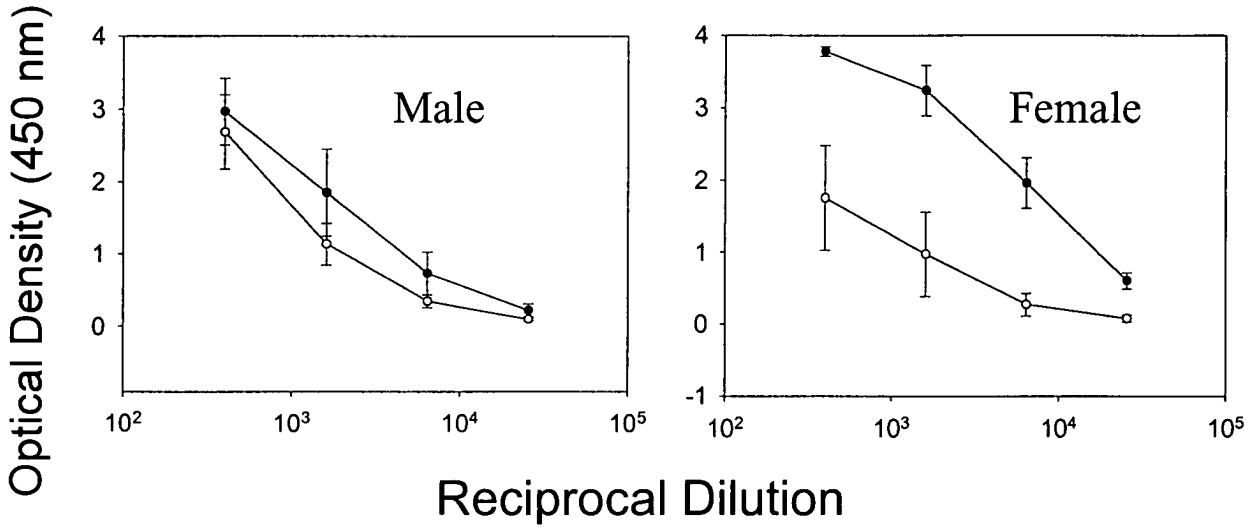


FIG. 19A

FIG. 19B

Antibody titers in macaques immunized with polyvalent DNA and gp120 protein

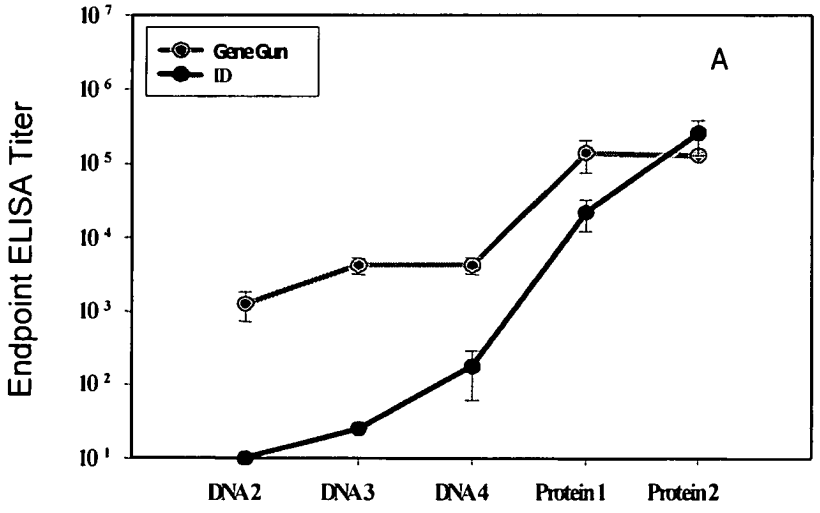


FIG. 20A

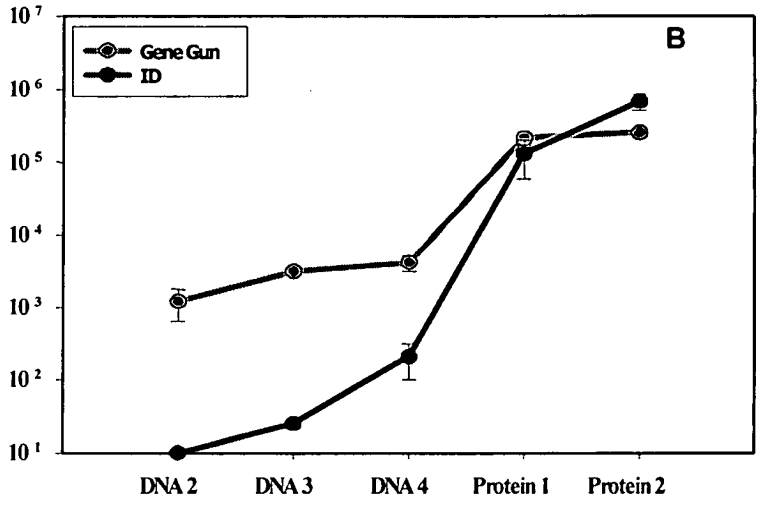


FIG. 20B

Antibody titers in macaques immunized with polyvalent DNA and gp120 protein

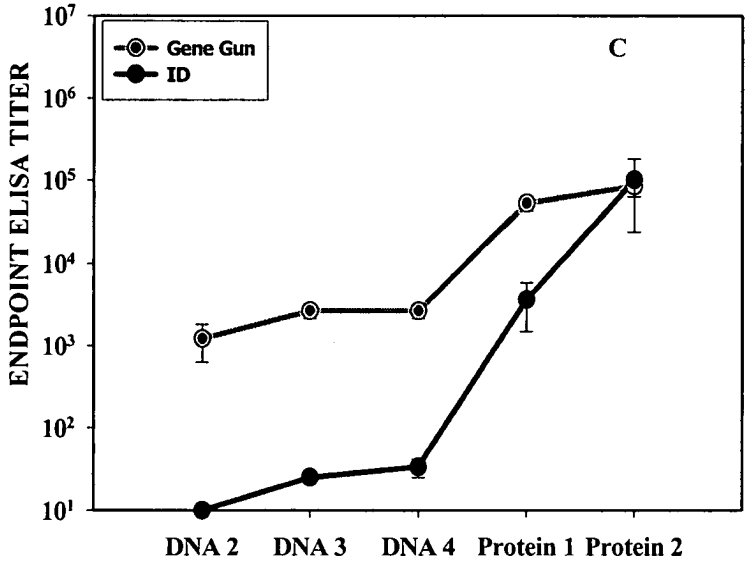


FIG. 20C

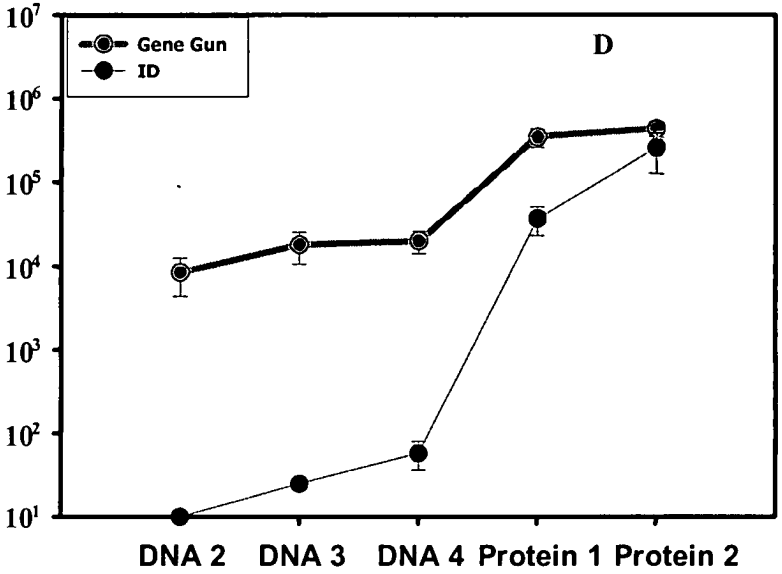


FIG. 20D

Antibody titers in macaques immunized with polyvalent DNA and gp120 protein

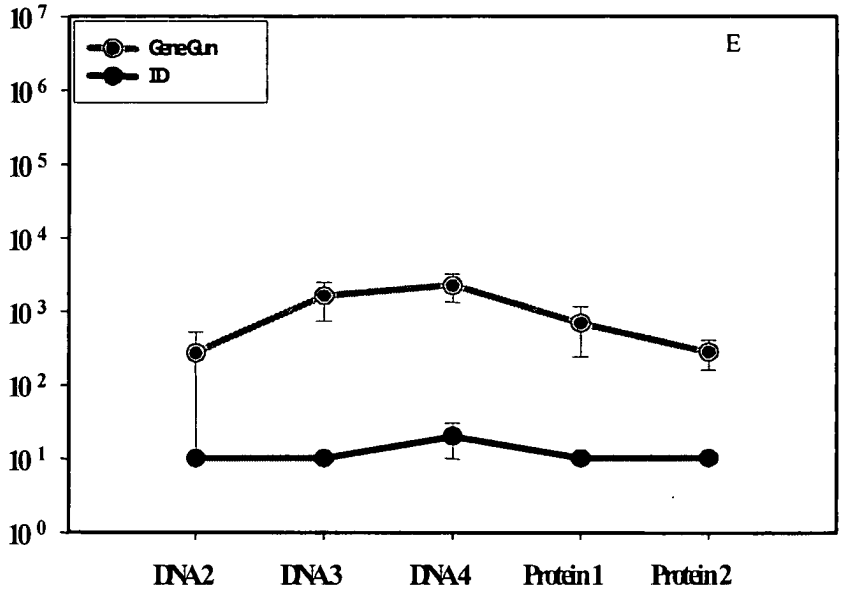


FIG. 20E

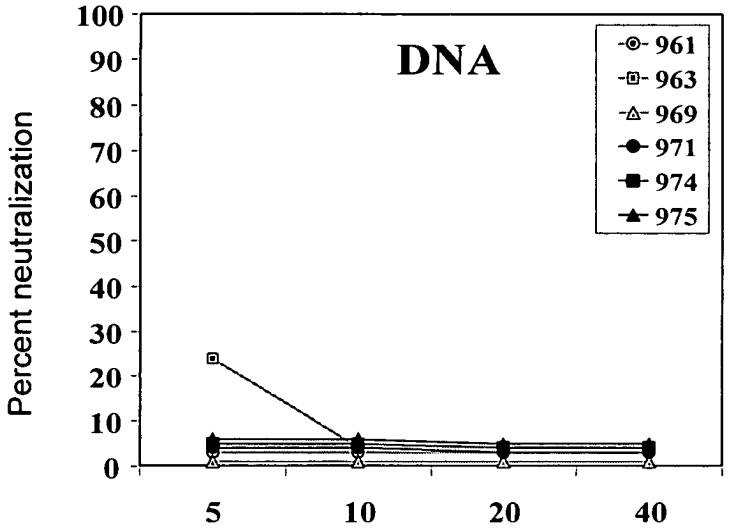
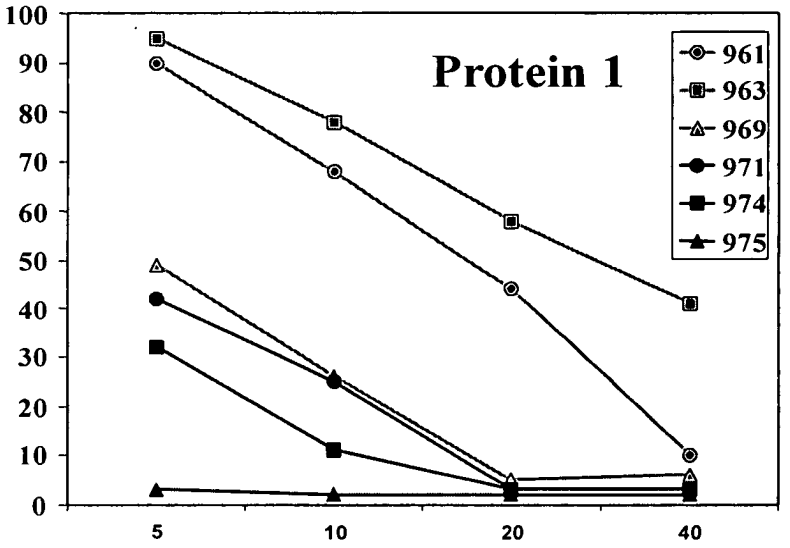


FIG. 21A



Reciprocal serum dilution

FIG. 21B

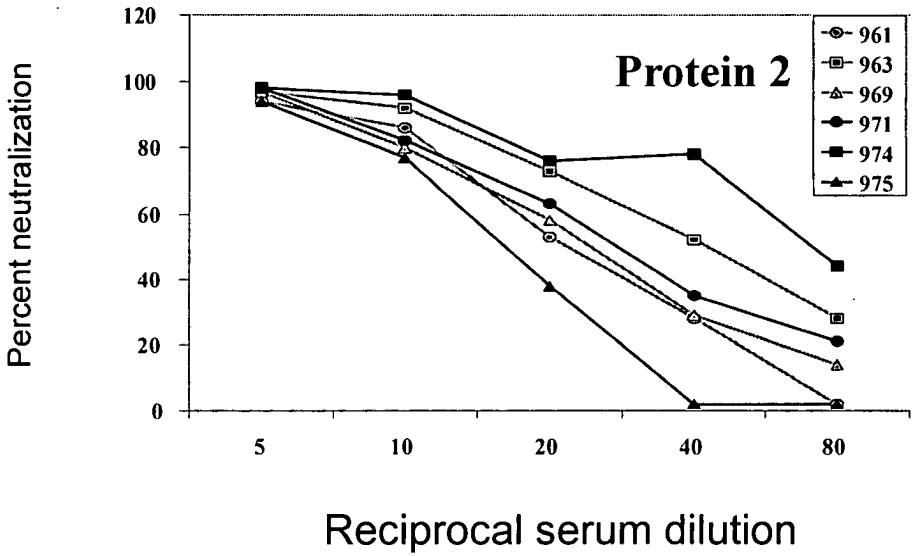

Protein 2
961
963
969
971
974
975
120
100
80
60
40
20
0
Percent neutralization
5
10
20
40
80
Reciprocal serum dilution

FIG. 21C

FIG. 22A

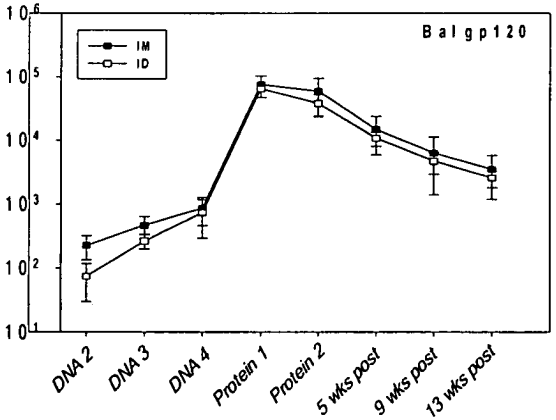
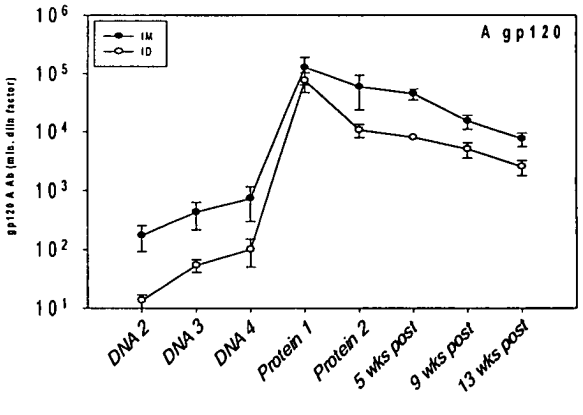


FIG. 22B



ENDPOINT ELISA TITER

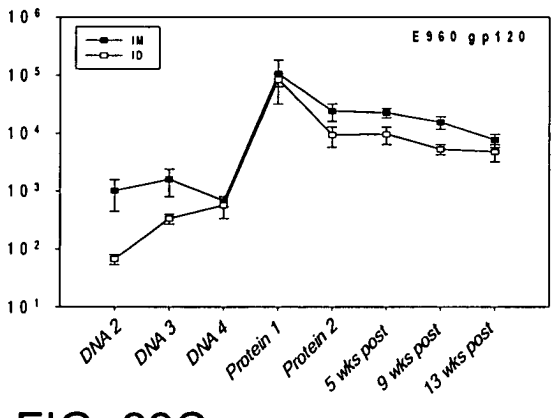


FIG. 22C

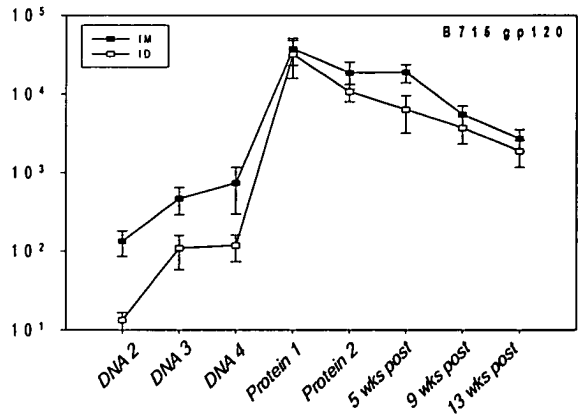


FIG. 22D

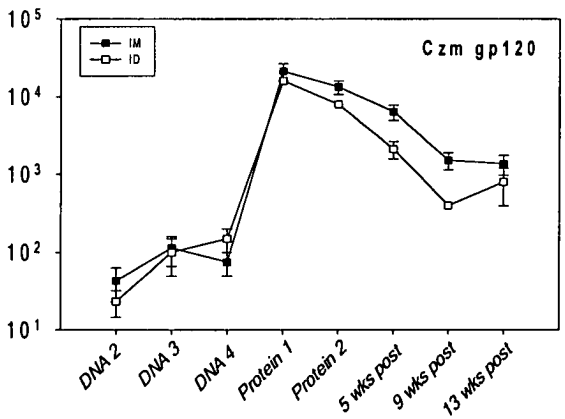


FIG. 22E

FIG. 23A

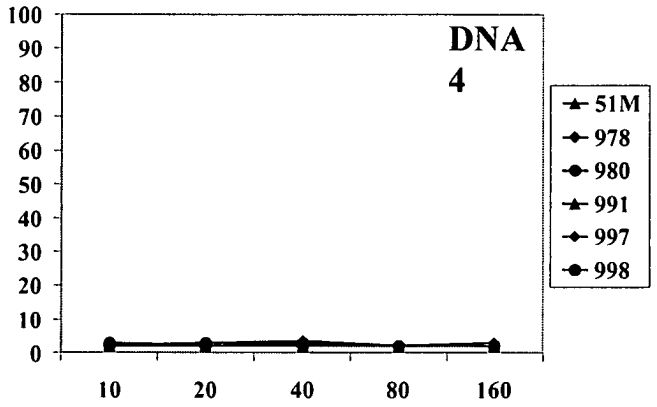
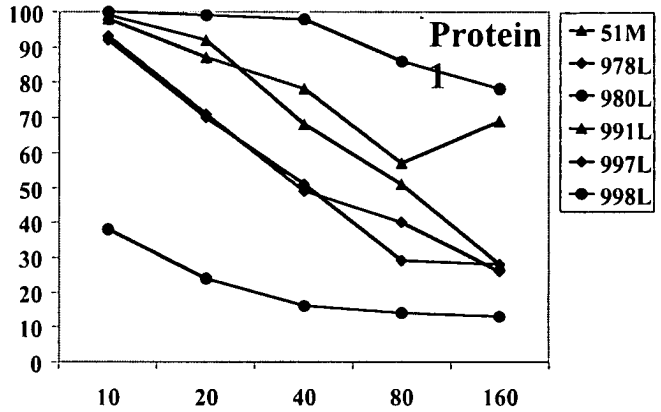


FIG. 23B



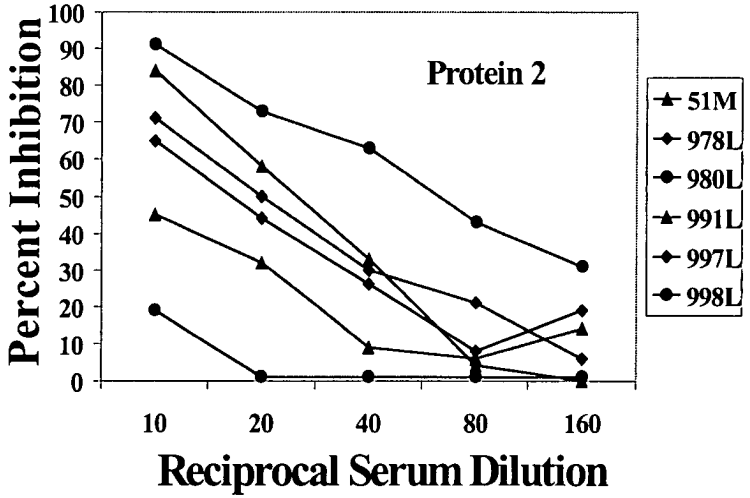


FIG. 23C

ID

IM

FIG. 24A FIG. 24B FIG. 24C FIG. 24J FIG. 24K FIG. 24L

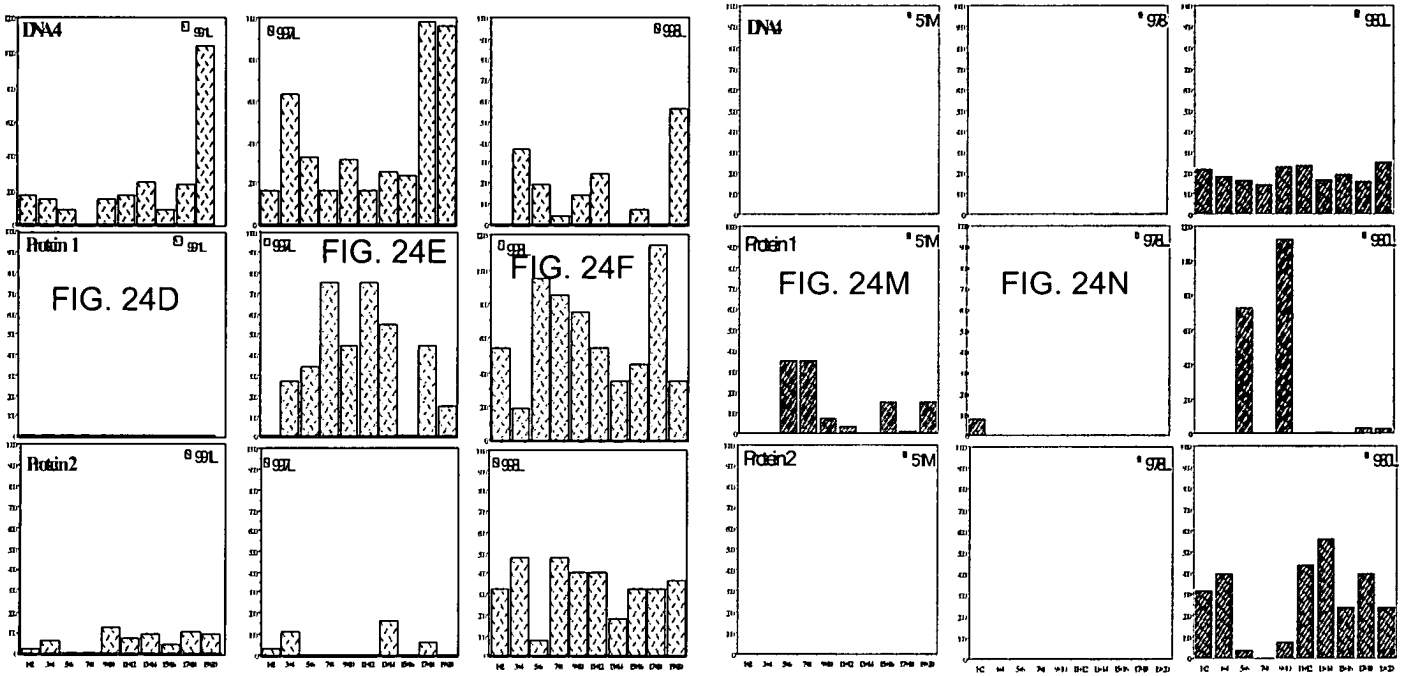


FIG. 24G FIG. 24H FIG. 24I FIG. 24P FIG. 24Q FIG. 24R

FIG. 25A

FIG. 25B

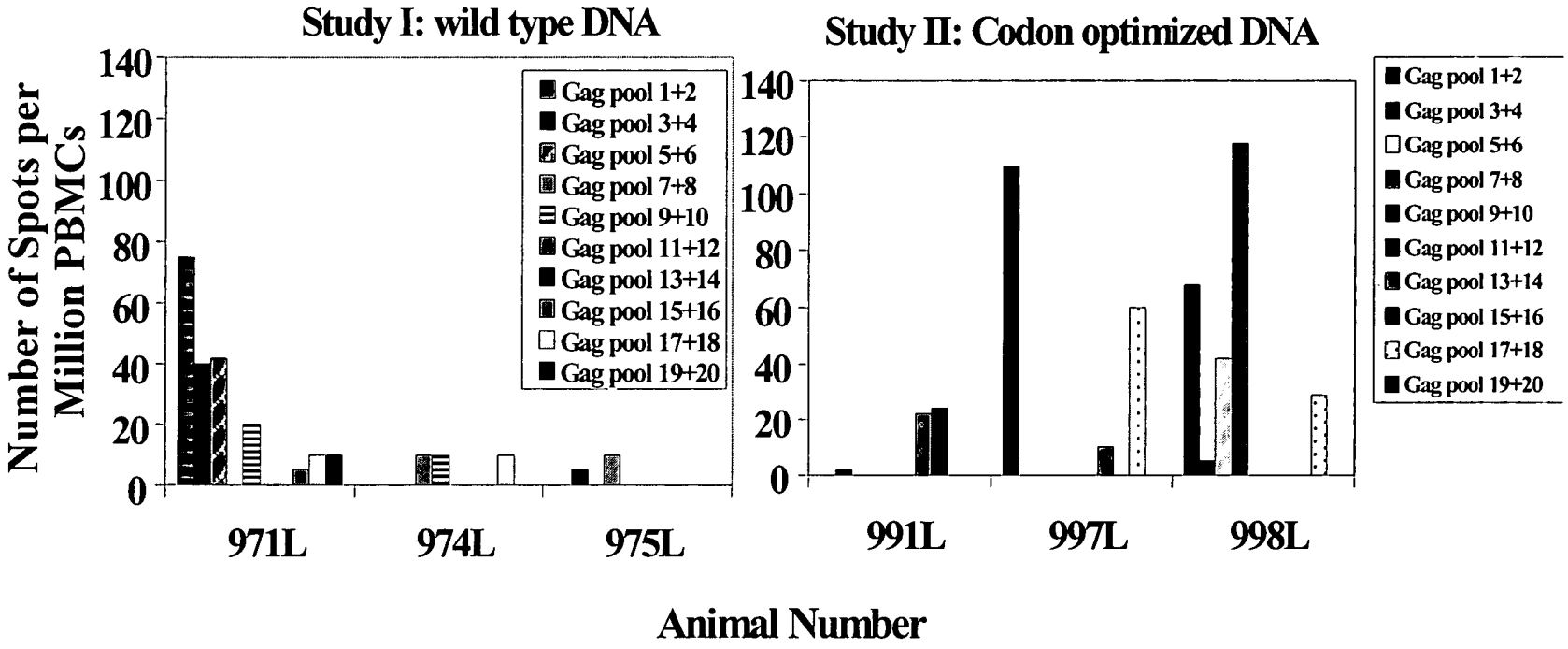


FIG. 26A

FIG. 26B

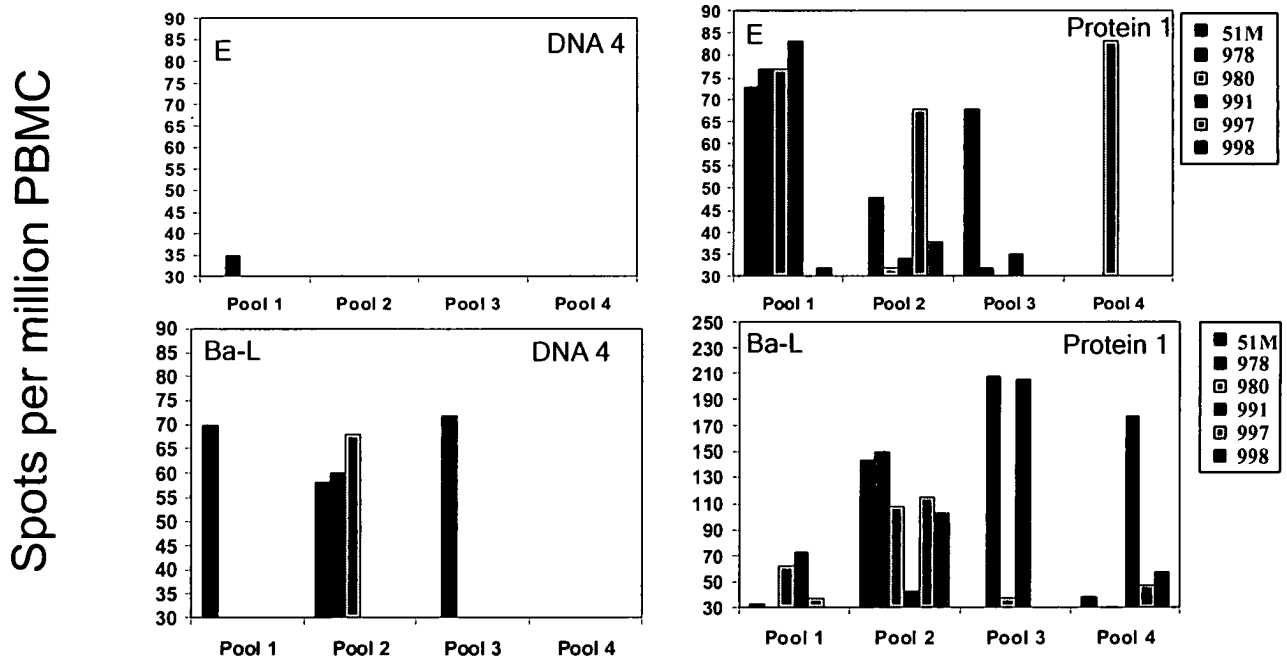


FIG. 26C

FIG. 26D

Wild type Gag.Czm DNA sequence:

ATGGGTGCGAGAGCGTCAATATTAAGAGGGGGAAAATTAGATAAATGGGAAAAAATTAGGCTAAGGCCAGGGGGAAAGA
AACGCTATATGATAAAACACCTAGTATGGGCAAGCAGGGAGCTGGAAAGATTTGCGCTTAACCCTGGCCTTTTAGAAACAT
CAGAAGGCTGTAAACAAATAATGAAACAGCTACAACCAGCTCTTCAGACAGGAACGGAGGAACTTAGATCATTATACAACA
CAGTAGCAACTCTCTATTGTGTACATGAAGGGGTAGAGGTACGAGACACCAAGGAAGCCTTAGACAGGATAGAGGAAGAA
CAAAACAAAATTCAGCAAAAAATACAGCAAAAAACACAGCAAGCGGCTGACGGAAAGGTCAGTCAAAATTATCCTATAGT
GCAGAATCTCCAAGGGCAAATGGTACACCAGAAACTATCACCTAGAACTTTGAATGCATGGGTAAAAGTAATAGAAGAAA
AAGCTTTTAGCCCAGAGGTAATACCCATGTTTACAGCATTATCAGAAGGAGCCACCCCACAAGATTTAAACACCATGTTAAA
TACAGTGGGGGGACATCAAGCAGCCATGCAAATGTTAAAAGATACTATCAATGAGGAGGCTGCAGAATGGGATAGATTAC
ATCCAGTGCATGCAGGGCCTATTGCACCAGGCCAAATGAGAGAACCAAGGGGAAGTGATATAGCAGGAACTACTAGTACCC
TCCAAGAACAGATAGCATGGATGACAAGTAATCCCCCTATTCCAGTGGGAGACATCTATAAAAGATGGATAATTCTGGGGT
TAAATAAAATAGTAAGAATGTATAGCCCTGTCAGCATTTTGGACATAAAACAAGGGCCAAAGGAACCCTTTAGAGACTATG
TAGACCGGTTCTTCAAAACTTTAAGAGCTGAACAGGCTACACAAGAAGTAAAAAATTGGATGACAGACACCTTGTTGGTCC
AAAATGCAAACCCAGATTGCAAGACCATTTTAAAAGCATTAGGACCAGGGGCTACATTAGAAGAAATGATGACAGCATGTC
AAGGAGTGGGAGGACCTAGCCACAAAGCAAGAGTGTTGGCTGAGGCAATGAGCCAAACAAATAGTGTAAACATACTGATG
CAGAAAAGCAATTTTAAAGGAAATAAAAGAATGGTTAAATGTTTTAACTGTGGTAAGGAAGGGCACATAGCCAGAAATTGC
AGGGCCCCTAGGAAAAAGGGCTGTTGGAAATGTGGAAAGGAGGGACACCAAATGAAAGACTGTACTGAGAGGCAGGCTAA
TTTTTTAGGGAAAATTTGGCCTTCCCACAAGGGAAGGCCAGGGAATTTCCTTCAGAACAGGCCAGAGCCAACAGCCCCACC
AGCAGAGAGCTTCAGGTTCGAGGAGACAACCCCCGCTCCGAAGCAGGAGTCGAAAGACAGGGAAGCCTTAACTTCCCTCAA
ATCACTCTTTGGCAGCGACCCCTTGTCTCAATAA (SEQ ID NO:5)

FIG. 27

Codon optimized Gag.Czm DNA sequence:

ATGGGAGCCAGAGCCAGCATCCTGAGAGGAGGCAAACTGGACAAGTGGGAGAAGATTAGACTGCGG
CCTGGAGGCAAGAAACGGTACATGATCAAGCACCTGGTGTGGGCCAGCAGAGAGCTGGAGCGGTTCG
CACTGAATCCTGGCCTCCTGGAGACCAGCGAAGGATGCAAACAGATCATGAAGCAGCTCCAACCAGC
TCTGCAGACCGGCACTGAGGAACTGAGAAGCCTGTACAACACCGTGGCCACCCTGTACTGCGTGCAC
GAGGGCGTGGAAGTGCGGGACACCAAGGAGGCCCTGGACCGGATCGAGGAAGAGCAGAACAAGATC
CAGCAAAAGATCCAGCAGAAGACCCAACAGGCCGCTGATGGAAAGGTGAGCCAGAACTACCCCATC
GTCCAGAACCTCCAGGGCCAGATGGTGCACCAGAAGCTGAGCCCTCGGACACTGAACGCCTGGGTCA
AGGTGATCGAAGAGAAGGCCTTCAGCCCTGAAGTGATCCCCATGTTCACAGCTCTGAGCGAAGGCGC
CACTCCTCAGGACCTGAACACCATGCTGAACACCGTGGGAGGCCACCAAGCTGCAATGCAGATGCTG
AAGGACACCATCAACGAGGAAGCTGCCGAGTGGGACAGACTGCATCCAGTCCACGCCGGACCCATCG
CTCCTGGCCAGATGCGGGAACCTAGAGGAAGCGATATCGCTGGCACTACCTCCACCCTGCAAGAGCA
GATCGCTTGGATGACCAGCAACCCCCCTATCCCCGTCGGCGACATCTACAAGCGGTGGATCATCCTGG
GCCTGAACAAGATCGTGAGAATGTACAGCCCCGTGAGCATCCTGGACATCAAGCAAGGACCTAAGGA
GCCCTTCAGAGACTACGTCGACCGGTTCTTTAAGACTCTGAGAGCCGAGCAGGCAACCCAGGAGGTG
AAGAACTGGATGACCGACACACTGCTGGTCCAGAACGCCAACCCCGACTGCAAGACCATCCTGAAGG
CTCTGGGACCCGGCGCCACACTGGAAGAGATGATGACAGCATGCCAGGGCGTCGGAGGACCAAGCCA
CAAAGCAAGAGTGCTCGCCGAGGCCATGAGCCAGACCAACAGCGTGAATATCCTGATGCAGAAGAGC
AACTTCAAAGGCAACAAGCGGATGGTCAAGTGCTTCAACTGTGGCAAGGAAGGACACATCGCACGGA
ACTGCAGAGCTCCACGGAAGAAAGGCTGCTGGAAGTGCGGCAAGGAAGGACACCAGATGAAGGACT
GCACAGAGCGGCAAGCAAACTTCCTCGGAAAGATCTGGCCAAGCCACAAGGGAAGACCCGGCAATTT
CCTGCAGAACAGACCTGAGCCCACCGCCCCACCTGCTGAGAGCTTCCGGTTCGAAGAGACCACACCC
GCCCCCAAGCAGGAGAGCAAGGACAGAGAAGCACTGACCAGCCTGAAGAGCCTGTTCGGCAGCGAT
CCCCTGAGCCAGTGA (SEQ ID NO:6)

FIG. 28

Wild type gp120.Bal DNA sequence:

TTGTGGGTCACAGTCTATTATGGGGTACCTGTGTGGAAAGAAGCAACCACCACTCTATTTTGTGCATCAGATGCTA
AAGCATATGATACAGAGGTACATAATGTTTGGGCCACACATGCCTGTGTACCCACAGACCCCAACCCACAAGAAG
TAGAATTGGAAAATGTGACAGAAAATTTTAACATGTGGAAAAATAACATGGTAGAACAGATGCATGAGGATATA
ATCAGTTTATGGGATCAAAGCCTAAAGCCATGTGTAAAATTAACTCCACTCTGTGTTACTTTAAATTGCACTGATTT
GAGGAATGCTACTAATGGGAATGACACTAATACCACTAGTAGTAGCAGGGAAATGATGGGGGGAGGAGAAATGA
AAAATTGCTCTTTCAAAATCACCACAAACATAAGAGGTAAGGTGCAGAAAGAATATGCACTTTTTTATGAACTTG
ATATAGTACCAATAGATAATAATAGTAATAATAGATATAGGTTGATAAGTTGTAACACCTCAGTCATTACACAGG
CCTGTCCAAAGATATCCTTTGAGCCAATTCCCATACATTATTGTGCCCCGGCTGGTTTTGCGATTCTAAAGTGTAAA
GATAAGAAGTTCAATGGAAAAGGACCATGTTCAAATGTCAGCACAGTACAATGTACACATGGGATTAGGCCAGTA
GTATCAACTCAACTGCTGTTAAATGGCAGTCTAGCAGAAGAAGAGGTAGTAATTAGATCCGAAAATTTCGCGGAC
AATGCTAAAACCATAATAGTACAGCTGAATGAATCTGTAGAAATTAATTGTACAAGACCCAACAACAATACAAGA
AAAAGTATACATATAGGACCAGGCAGAGCATTATATACAACAGGAGAAATAATAGGAGATATAAGACAAGCACA
TTGTAACCTTAGTAGAGCAAAATGGAATGACACTTTAAATAAGATAGTTATAAAATTAAGAGAACAATTTGGGAA
TAAAACAATAGTCTTTAAGCATTCCTCAGGAGGGGACCCAGAAATTGTGACGCACAGTTTTAATTGTGGAGGGGA
ATTTTTCTACTGTAATTCAACACAACTGTTTAATAGTACTTGGAATGTTACTGAAGAGTCAAATAACACTGTAGAA
AATAACACAATCACACTCCCATGCAGAATAAAACAAATTATAAACATGTGGCAGAAAGTAGGAAGAGCAATGTA
TGCCCCTCCCATCAGAGGACAAATTAGATGTTCATCAAATATTACAGGGCTGCTATTAACAAGAGATGGTGGTCCA
GAGGCAAACAAGACCGAGGTCTTCAGACCTGGAGGAGGAGATATGAGGGACAATTGGAGAAGTGAATTATATAA
ATATAAAGTAGTAAAAATTGAACCATTAGGAGTAGCACCCACCAAGGCAAAGAGAAGAGTGGTGGAGTAA (SEQ
ID NO:7)

FIG. 29

Codon optimized gp120.Bal DNA sequence:

CTGTGGGTGACCGTGTACTACGGCGTGCCCGTGTGGAAGGAGGCCACCACCACCCTGTTCTGCGCCAGCGACCGCAAGGCCTACGA
CACCGAGGTGCACAACGTGTGGGCCACCCACGCCTGCGTGCCCACCGACCCCAACCCCCAGGAGGTGGAGCTGAAGAACGTGACC
GAGAACTTCAACATGTGGAAGAACAACATGGTGGAGCAGATGCACGAGGACATCATCAGCCTGTGGGACCAGAGCCTGAAGCCCT
GCGTGAAGCTGACCCCCCTGTGCGTGACCCTGAACTGCACCGACCTGCGCAACGCCACCAACGGCAACGACACCAACACCACTAGT
AGCAGCCGCGGCATGGTGGGCGGCGGCGAGATGAAGAACTGCAGCTTCAACATCACCACCAACATCCGCGGCAAGGTGCAGAAGG
AGTACGCCCTGTTCTACAAGCTGGACATCGCCCCCATCGACAACAACAGCAACAACCGCTACCGCCTGATCAGCTGCAACACCAGC
GTGATCACCCAGGCCTGCCCCAAGGTGAGCTTCGAGCCCATCCCCATCCACTACTGCGCCCCCGCCGGCTTCGCCATCCTGAAGTGC
AAGGACAAGAAGTTCAACGGCAAGGGCCCCTGCACCAACGTGAGCACCGTGCAGTGCACCCACGGCATCCGCCCCGTGGTGAGCA
CCCAGCTGCTGCTGAACGGCAGCCTGGCCGAGGAGGAGGTGGTGATCCGCAGCGCCAACTTCGCCGACAACGCCAAGGTGATCAT
CGTGCAGCTGAACGAGAGCGTGGAGATCAACTGCACCCGCCCCAACAACAACACCCGCAAGTCCATCCACATCGGCCCCGGCCGC
GCCTTCTACACCACCGGCGAGATCATCGGCGACATCCGCCAGGCCCACTGCAACCTGAGCCGCGCCAAGTGGAACGACACCCTGAA
CAAGATCGTGATCAAGCTGCGCGAGCAGTTCGGCAACAAGACCATCGTGTTCAAGCACAGCAGCGGCGGCGACCCCGAGATCGTG
ACCCACAGCTTCAATTGCGGCGGCGAGTTCTTCTACTGCAACAGCACCCAGCTGTTCAACAGCACCTGGAACGTGACCGAGGAGAG
CAACAACACCGTGGAGAACAACACCATCACCCTGCCCTGCCGCATCAAGCAGATCATCAACATGTGGCAGGAGGTGGGCCGCGCC
ATGTACGCCCCCCCCATCCGCGGCCAGATCCGCTGCAGTTCGAACATCACCGGCCTGCTGCTGACCCGCGACGGCGGCCCCGAGGA
CAACAAGACCGAGGTGTTCCGCCCCGGCGGCGGCGACATGCGCGACAACTGGCGCAGCGAGCTGTACAAGTACAAGGTGGTGAAG
ATCGAGCCCCTGGGCGTGGCCCCCACCAAGGCCAAGCGCCGCGTGGTGGAGTAA (SEQ ID NO:8)

FIG. 30

Wild type gp120.B DNA sequence:

TTGTGGGTCACAGTCTATTATGGGGTACCTGTGTGGAAAGAAGCAAACACCACTCTATTTTGTGCATCAGATGC
TAAAGCATATGATACAGAGGTACATAATGTTTGGGCCACACATGCCTGTGTACCCACAGACCCCGATCCACAAG
AAGTAGAATTGGAAAATGTGACAGAAAATTTTAACATGTGGAAAAATAACATGGTAGAACAGATGCATGAGG
ATATAATTAGTTTATGGGATCAAAGCCTAAAGCCATGTGTAAAATTAACCCCACTCTGTGTTACTCTAAATTGC
ACCAATCTGAGGAATGATACTAATACCACGAGGAATGCTACTAATACCACGAGTAGTGAGACAATGATGGAGG
AGGGAGAAATAAAAAATTGCTCTTTCAATATCACCACAAGCATAAGAGATAAGGTGCAAAAAGAATTTGCACT
TTTTTATAAACTTGATGTAGTACCAATAGAAAATGATACTACTAGCTATAGGTTGATAAGTTGTAATACCTCAG
TCCTTACACAGGCCTGCCCAAAGGTATCCTTTGAGCCAATTCCCATACATTTTTGTGCCCCGGCTGGTTTTGCAA
TTCTAAAGTGTAAAGATAAGAAGTTCAATGGAACAGGACCATGTACAAATGTCAGCACAGTACAATGCACACA
TGGAATTAAGCCAGTAGTATCAACTCAACTGCTGTTAAATGGCAGTCTAGCAGAAGAAGAGGTAGTAATTAGG
TCCGCCAATCTCTCGGACAATGCTAAAACCATAATAGTACAGCTGAATGAATCTGTACAAATGAATTGTACGAG
ACCCAACAACAATACAAGAAAAAGTATACATATAGGACCAGGCAGAGCATTTTATACAACAGGAGAAATAAT
AGGAGATATAAGACAAGCACATTGTAACCTTAGTAGAACAAAATGGAATGAAACTTTAAAAAGGATAGTTATA
AAATTAAGAGAGCAATATGAGAATAAAACAATAGTCTTTAATCAATCCTCAGGAGGGGACCCAGAAATTGTAA
TGCTCAGCTTTAATTGTGGAGGGGAATTTTTCTACTGTAATTCAACAAAACTGTTTAATAGTACTTGGAATGGTA
CTGAGTCAAATAACACAGGAGATGACCCAATCGTACTCCCATGCAGAATAAAACAAGTTATAAACATGTGGCA
AGAAGTAGGAAAAGCAATGTATGCCCCTCCCATCAGAGGACAAATTAGATGCTCATCAAATATTACAGGACTG
CTATTAACAAGAGATGGTGGTAACAGTAACGAGACCAATACCACCGAGATCTTCAGACCTGGGGGAGGAAATA
TGAAGGACAATTGGAGAAGTGAATTATATAAATATAAAGTAGTAAGAATTGAACCATTAGGAATAGCACCCAC
CAGGGCAAAGAGAAGAGTGGTGGAGTAA (SEQ ID NO:9)

FIG. 31

Codon optimized gp120.B DNA sequence:

CTGTGGGTGACCGTCTACTATGGGGTGCCTGTGTGGAAGGAGGCCAACACCACTCTGTTCTGCGCTTCTGACGCTAAGGCCTACGAT
ACCGAGGTGCACAATGTGTGGGCCACCCACGCCTGTGTGCCCACCGACCCCGACCCTCAGGAGGTGGAGCTGGAGAACGTGACCGA
AAACTTCAACATGTGGAAGAATAACATGGTGGAGCAGATGCATGAGGATATCATTAGCCTGTGGGACCAGAGCCTAAAGCCCTGCG
TGAAGCTGACCCCCCTGTGTGTGACTCTGAACTGCACCAACCTGAGGAATGATACTAACACCACCAGGAACGCCACTAATACGACCA
GCAGCGAGACCATGATGGAGGAGGGCGAGATCAAGAACTGCTCTTTCAACATCACCACGAGCATCAGAGACAAGGTGCAGAAGGA
GTTTGCCCTTTTCTATAAACTTGATGTGGTGCCTATCGAGAATGACACTACTAGCTACAGGCTGATCAGCTGCAACACCAGCGTCCTG
ACACAGGCCTGCCCCAAGGTGTCCTTCGAGCCAATTCCCATCCACTTTTGTGCCCCGGCTGGTTTCGCCATTCTAAAGTGCAAGGATA
AGAAGTTCAACGGCACCGGTCCTTGTACCAATGTCAGCACCGTACAATGCACCCACGGCATTAAGCCCGTGGTGAGCACTCAGCTGC
TGCTGAACGGCAGCCTGGCCGAGGAAGAGGTGGTGATTCGCTCCGCCAACCTCTCTGACAATGCTAAGACCATAATCGTGCAGCTGA
ACGAGTCTGTGCAGATGAACTGCACGAGGCCCAACAACAATACCAGGAAGAGTATCCATATCGGTCCCGGCAGGGCATTCTATACC
ACCGGCGAGATCATCGGCGACATCAGGCAGGCCCACTGTAACCTTAGCAGGACAAAGTGGAACGAGACTCTGAAGAGGATCGTGAT
CAAGCTGAGGGAGCAGTACGAGAACAAGACCATCGTCTTTAATCAATCCAGCGGCGGGGACCCTGAGATTGTGATGCTGAGCTTCA
ACTGCGGTGGGGAGTTCTTCTACTGTAACTCAACCAAGCTGTTTAATAGCACTTGGAACGGCACTGAGTCTAACAACACCGGTGATG
ACCCCATCGTGCTGCCATGCAGGATCAAGCAGGTGATCAACATGTGGCAGGAAGTGGGCAAGGCCATGTATGCCCCTCCCATCAGG
GGTCAGATTAGGTGCAGCAGCAATATTACCGGCCTGCTACTGACCCGCGACGGCGGTAACAGCAACGAGACCAACACCACCGAGAT
CTTCAGGCCTGGGGGCGGCAACATGAAGGACAATTGGAGGAGCGAGTTATACAAATATAAGGTGGTGAGGATTGAGCCTCTGGGTA
TCGCCCCCACCAGGGCCAAGAGGAGGGTGGTGCAGTAA (SEQ ID NO:10)

FIG. 32

Wild type gp120.Czm DNA sequence:

TTGTGGGTCACAGTCTATTATGGGGTACCTGTGTGGAAAGAAGCAAAAACTACTCTATTCTGTGCATCAGATGCTA
AATCATATGAGAAAGAAGTGCATAATGTCTGGGCTACACATGCCTGTGTACCCACAGACCCCAACCCACAAGAAA
TAGTTTTGGGAAATGTAACAGAAAATTTTAACATGTGGAAAAATGACATGGTGGATCAGATGCATGAGGATATAA
TCAGTTTATGGGATCAAAGCCTAAAGCCATGTGTAAAGTTGACCCCACTCTGTGTCACTTTAAATTGTACAGAGGT
TAATGTTACCAGAAATGTTAATAATAGCGTGGTTAATAATACCACAAATGTTAATAATAGCATGAATGGAGACAT
GAAAAATTGCTCTTTCAACATAACCACAGAACTAAAAGATAAGAAAAAGAATGTGTATGCACTTTTTTATAAACTT
GATATAGTATCACTTAATGAGACTGACGACTCTGAGACTGGCAACTCTAGTAAATATTATAGATTAATAAATTGTA
ATACCTCAGCCCTAACACAAGCCTGTCCAAAGGTCTCTTTTGACCCAATTCCTATACATTATTGTGCTCCAGCTGGT
TATGCGATTCTAAAGTGTAATAATAAGACATTCAATGGGACAGGACCATGCCATAATGTCAGCACAGTACAATGT
ACACATGGAATTAAGCCAGTGGTATCAACTCAACTACTGTTAAATGGTAGCCTAGCAGAAGAAGGGATAATAATT
AGATCTGAAAATCTGACAAACAATGTCAAAACAATAATAGTACATCTTAATAGATCTATAGAAATTGTGTGTGTA
AGACCCAACAATAATACAAGACAAAGTATAAGAATAGGACCAGGACAAACATTCTATGCAACAGGAGACATAAT
AGGAGACATAAGACAAGCACATTGTAACATTAGTAGGACTAACTGGACTAAGACTTTACGAGAGGTAAGGAACA
AATTAAGAGAACACTTCCCTAATAAAAACATAACATTTAAACCATCCTCAGGAGGGGACCTAGAAATTACAACAC
ATAGCTTTAATTGTAGAGGAGAATTTTTCTATTGCAATACATCGGGCCTGTTTAGTATAAATTATACAGAAAATAA
TACAGATGGTACACCCATCACACTCCCATGCAGAATAAGACAAATTATAAATATGTGGCAGGAAGTAGGACGAGC
AATGTACGCCCCTCCCATTGAAGGAAACATAGCATGTAAATCAGATATCACAGGGCTACTATTGGTTCGGGATGG
AGGAAGCACAAATGATAGCACAAATAATAACACAGAGATATTCAGACCTGCAGGAGGAGATATGAGGGACAATT
GGAGGAGTGAATTGTATAAGTATAAAGTGGTAGAAATTAAGCCATTGGGAATAGCACCCACTGAGGCAAAAAGG
AGAGTGGTGGAGTAA (SEQ ID NO:11)

FIG. 33

Codon optimized gp120.Czm DNA sequence:

TGGGGCAACCTGTGGGTGACCGTGTACTACGGCGTGCCCGTGTGGAAGGAGGCCAAGACCACCCTGTTCTGCGCCAGCG
ACGCCAAGAGCTACGAGAAGGAGGTGCACAACGTGTGGGCCACCCACGCCTGCGTGCCCACCGACCCCAACCCCCAGGA
GATCGTGCTGGGCAACGTGACCGAGAACTTCAACATGTGGAAGAACGACATGGTGGACCAGATGCACGAGGACATCATC
AGCCTGTGGGACCAGAGCCTGAAGCCCTGCGTGAAGCTGACCCCCCTGTGCGTGACCCTGAACTGCACCGAGGTGAACGT
GACCCGCAACGTGAACAACAGCGTGGTGAACAACACCACCAACGTGAACAACAGCATGAACGGCGACATGAAGAACTG
CAGCTTCAACATCACCACCGAGCTGAAGGACAAGAAGAAGAACGTGTACGCCCTGTTCTACAAGCTGGACATCGTGAGC
CTGAACGAGACCGACGACAGCGAGACCGGCAACAGCAGCAAGTACTACCGCCTGATCAACTGCAACACCAGCGCCCTGA
CCCAGGCCTGCCCCAAGGTGAGCTTCGACCCCATCCCCATCCACTACTGCGCCCCCGCCGGCTACGCCATCCTGAAGTGC
AACAACAAGACCTTCAACGGCACCGGCCCCTGCCACAACGTGAGCACCGTGCAGTGCACCCACGGCATCAAGCCCGTGG
TGAGCACCCAGCTGCTGCTGAACGGCAGCCTGGCCGAGGAGGGCATCATCATCCGCAGCGAGAACCTGACCAACAACGT
GAAGACCATCATCGTGCACCTGAACCGCAGCATCGAGATCGTGTGCGTGCGCCCCAACAACAACACCCGCCAGAGCATC
CGCATCGGCCCCGGCCAGACCTTCTACGCCACCGGCGACATCATCGGCGACATCCGCCAGGCCCACTGCAACATCAGCCG
CACCAACTGGACCAAGACCCTGCGCGAGGTGCGCAACAAGCTGCGCGAGCACTTCCCCAACAAGAACATCACCTTCAAG
CCCAGCAGCGGCGGCGACCTGGAGATCACCACCCACAGCTTCAACTGCCGCGGCGAGTTCTTCTACTGCAACACCAGCGG
CCTGTTCAGCATCAACTACACCGAGAACAACACCGACGGCACCCCCATCACCCTGCCCTGCCGCATCCGCCAGATCATCA
ACATGTGGCAGGAGGTGGGCCGCGCCATGTACGCCCCCCCCATCGAGGGCAACATCGCCTGCAAGAGCGACATCACCGG
CCTGCTGCTGGTGCGCGACGGCGGCAGCACCAACGACAGCACCAACAACAACACCGAGATCTTCCGCCCCGCCGGCGGC
GACATGCGCGACAACTGGCGCAGCGAGCTGTACAAGTACAAGGTGGTGGAGATCAAGCCCCTGGGCATCGCCCCCACCG
AGGCCAAGCGCCGCGTGGTGGAGCGCGAGAAGCGCTGA (SEQ ID NO:12)

FIG. 34

Wild type gp120.E DNA sequence

TTGTGGGTCACAGTCTATTATGGGGTACCTGTGTGGAAAGATGCAGATACCACCCTATTTTGTGCATCAGATGCCAA
AGCACATGAGACAGAAGTGCACAATGTCTGGGCCACACATGCCTGTGTACCCACAGACCCCAACCCACAAGAAATA
CACCTGGAAAATGTAACAGAAAATTTTAACATGTGGAAAAATAAAATGGTAGAGCAGATGCAGGAGGATGTAATC
AGTTTATGGGATCAAAGTCTAAAGCCATGTGTAAAGTTAACTCCTCTCTGCGTTACTTTGACTTGTACCAATGCTACT
CTGAATTGTACCAATTTGACCAATGGCAATAAGACAACTAATGTCTCTAACATAATAGGAAATCTAACAGATGAAG
TAAGAAACTGTTCTTTTCATATGACCACAGAACTAAGAGATAAGAAGCAGAAGGTCTATGCACTTTTTTATAAGCTT
GATATAGTACAAATTAATAGTAGTGAGTATAGGTTAATAAATTGTAATACTTCAGTCATTAAGCAGGCTTGTCCAAA
GATATCCTTTGATCCAATTCCTATACATTATTGTACTCCAGCTGGTTATGCGATTTTAAAGTGTAATGATAAGAATTT
CAATGGGACAGGGCCATGTAAAAATGTCAGCTCAGTACAATGCACACATGGAATTAAGCCAGTGGTATCAACTCAA
TTGCTGTTAAATGGCAGTCTAGCAGAAGAAGAGATAATAATCAGCTCTGAAAATCTCACAAACAATGCCAAAACCA
TAATAGTGCACCTTAATAAATCTGTAGAAATCAGTTGTACCAGACCCTCCACCAATACAAGAACAAGTATACGTAT
AGGACCAGGACAAGTATTCTATAGAACAGGAGACATAACAGGAGATATAAGAAAAGCATATTGTGAGATTAATGA
AACAAAATGGAATGAAGCTTTAAAACAGGTAGCTGGGAAATTAAAAGAACACTTTAATAAGACAATAATCTTTCAA
CCACCCTCAGGAGGAGATCTAGAAATTACAATGCATCATTTTAATTGTAGAGGGGAATTTTTCTATTGCGATACAAC
ACAACTGTTTAATAGAACTTGGGGAGAAAATGAAACCAGAGAGGGGCGTAATATCACACTTCCATGCAAGATAAA
GCAAATTGTAAACATGTGGCAGGGAGCAGGGCAAGCAATGTATGCTCCTCCCATCAGTGGAATAATTAAGTGTGTA
TCAAATATTACAGGAATACTATTGACAAGAGATGGTGGTGCTAATAATTCGGCTAGTGAGACCTTCAGACCTGGAG
GAGGAAATATAAAGGACAATTGGAGAAGTGAATTATATAAATATAAAGTAGTACAAATTGAACCACTAGGAATAG
CACCCACCAGGGCAAAGAGAAGAGTGGTGGAGTAA (SEQ ID NO:13)

FIG. 35

Codon optimized gp120.E DNA sequence:

CTGTGGGTGACCGTGTACTACGGCGTGCCCGTGTGGAAGGACGCCGACACCACCCTGTTCTGCGCCAGCGACGCCAAGG
CCCACGAGACCGAGGTGCACAACGTGTGGGCCACCCACGCCTGCGTGCCCACCGACCCCAACCCCCAGGAGATCCACCT
GGAGAACGTGACCGAGAACTTCAACATGTGGAAGAACAAGATGGTGGAGCAGATGCAGGAGGACGTGATCAGCCTGT
GGGACCAGAGCCTGAAGCCCTGCGTGAAGCTGACCCCCCTGTGCGTGACCCTGACCTGCACCAACGCCACCCTGAACTG
CACCAACCTGACCAACGGCAACAAGACCACCAACGTGAGCAACATCATCGGCAACCTGACCGACGAGGTGCGCAACTG
CAGCTTCCACATGACCACCGAGCTGCGCGACAAGAAGCAGAAGGTGTACGCCCTGTTCTACAAGCTGGACATCGTGCAG
ATCAACAGCAGCGAGTACCGCCTGATCAACTGCAACACCAGCGTGATCAAGCAGGCCTGCCCCAAGATCAGCTTCGACC
CCATCCCCATCCACTACTGCACCCCTGCTGGCTACGCCATCCTGAAGTGCAACGACAAGAACTTCAACGGCACCGGACC
CTGCAAGAACGTGAGCAGCGTGCAGTGCACCCACGGCATCAAGCCCGTGGTGAGCACCCAGCTGCTGCTGAACGGCAG
CCTGGCCGAGGAGGAGATCATCATCAGCAGCGAGAACCTGACCAACAACGCCAAGACCATCATCGTGCACCTGAACAA
GAGCGTGGAGATCAGCTGCACTCGCCCCAGCACCAACACCCGCACCAGCATCCGCATCGGACCTGGCCAGGTGTTCTAC
CGCACCGGCGACATCACCGGCGACATCCGCAAGGCCTACTGCGAGATCAACGAGACCAAGTGGAACGAGGCCCTGAAG
CAGGTGGCCGGCAAGCTGAAGGAGCACTTCAACAAGACCATCATCTTCCAGCCTCCCAGCGGAGGCGACCTGGAGATC
ACCATGCACCACTTCAACTGCAGAGGCGAGTTCTTCTACTGCGACACCACCCAGCTGTTCAACCGCACCTGGGGCGAGA
ACGAGACCCGCGAGGGCAGGAACATCACCCTGCCCTGCAAGATCAAGCAGATCGTGAACATGTGGCAGGGAGCTGGCC
AGGCCATGTACGCCCCACCCATCAGCGGCATCATCAAGTGCGTGAGCAACATCACCGGCATCCTGCTGACCCGCGACGG
CGGTGCCAACAACAGCGCCAGCGAGACCTTCAGGCCAGGCGGTGGCAACATCAAGGACAACTGGCGCAGCGAGCTGTA
CAAGTACAAGGTGGTGCAGATCGAGCCCCTGGGCATCGCCCCCACTCGCGCCAAGCGCCGCGTGGTGGAGTAA (SEQ ID
NO:14)

FIG. 36

Wild type gp120.A DNA sequence:

TTGTGGGTCACAGTCTATTATGGGGTACCTGTGTGGAAAGATGCAGAGACTACCTTATTTTGTGCATCAGA
TGCGAAAGCATATGATACAGAAGTGCATAATGTCTGGGCTACGCATGCCTGTGTACCTACAGACCCCAAC
CCACAAGAAATATATATGGAAAATGTGACAGAAGAGTTTAACATGTGGAAAAATAACATGGTAGAGCAG
ATGCATACAGATATAATCAGTCTATGGGACCAAAGCCTAAAACCATGTGTACAGTTAACCCCTCTCTGCGT
TACTTTAGATTGTAGCTATAACATCACCAATAATATCACCAATAGCATCACCAATAGCTCAGTTAACATGA
GAGAAGAAATAAAAAACTGCTCTTTCAATATGACCACAGAATTAAGGGATAAGAATCGGAAGGTATATT
CACTTTTTTATAAACTTGATGTAGTACAAATTAATAATGGTAATAACAGTAGTAATCTGTATAGATTAATA
AATTGTAATACCTCAGCCCTTACACAGGCTTGTCCAAAGGTAACCTTTGAGCCAATTCCCATACGTTATTG
TGCCCCAGCTGGTTATGCGATTCTAAAATGTAATGATAAGGAGTTCAATGGAACAGGGCTATGCAAAAAT
GTCAGCACAGTGCAATGCACACATGGAATCAGGCCAGTAGTATCAACTCAACTGCTGTTAAATGGCAGTT
TAGCAGAAGGAAAGGTAATGATTAGATCTGAAAATATCACAAACAATGTCAAAAACATAATAGTACAAC
TTAACGAGACTGTAACAATTAATTGTACCAGACCTAACAACAATACAAGAAAAAGTGTACGTATAGGACC
AGGACAAACATTCTATGCAACAGGTGATATAATAGGGGATATAAGACAAGCACATTGTAATGTCAGTGG
GTCACAATGGAATAGAGCTTTACACCAGGTAGTTGGACAATTAAGAGAATACTGGAACACAACAATAATC
TTTAAAAACTCCTCAGGAGGGGATTTAGAAATTACAACACATAGTTTTAATTGTGGAGGAGAATTTTTCTA
TTGTAATACATCAGGCCTGTTTAATAGTAATTGGACACATAATGACACTGCCAGCATGAAACCAAATGAC
ACTATAACACTCCCATGCAGAATAAAGCAAATTATAAATATGTGGCAGAGAGTAGGACAAGCAATATAT
GCCCCTCCCATTCAAGGAGTAATAAGGTGTGAATCAAACATTACAGGACTAATATTAACAAGAGATGGTG
GGGGTAACATCAATGAAAGTCAAATCTTCAGACCTGGAGGAGGAGATATGAGGGACAATTGGAGAAGTG
AATTATATAAGTATAAGGTAGTAAGAATTGAACCACTAGGAGTAGCACCCACCAAGGCAAAGAGAAGAG
TGGTGGAGTAA (SEQ ID NO:15)

FIG. 37

Codon optimized gp120.A DNA sequence:

CTGTGGGTGACCGTGTACTACGGCGTGCCCGTGTGGAAGGACGCCGAGACCACCCTGTTCTGCGCCAGCGACGCCAAGGCC
TACGACACCGAGGTGCACAACGTGTGGGCCACCCACGCCTGCGTGCCCACCGACCCCAACCCCCAGGAGATCTACATGGAG
AACGTGACCGAGGAGTTCAACATGTGGAAGAACAACATGGTGGAGCAGATGCACACCGACATCATCAGCCTGTGGGACCA
GAGCCTGAAGCCCTGCGTGCAGCTGACCCCCCTGTGCGTGACCCTGGACTGCAGCTACAACATCACCAACAACATCACCAAC
AGCATCACCAACAGCAGCGTGAACATGCGCGAGGAGATCAAGAACTGCAGCTTCAACATGACCACCGAGCTGCGCGACAA
GAACCGCAAGGTGTACAGCCTGTTCTACAAGCTGGACGTGGTGCAGATCAACAACGGCAACAACAGCAGCAACCTGTACCG
CCTGATCAACTGCAACACCAGCGCCCTGACCCAGGCCTGCCCCAAGGTGACCTTCGAGCCCATCCCCATCCGCTACTGCGCC
CCCGCCGGCTACGCCATCCTGAAGTGCAACGACAAGGAGTTCAACGGCACCGGCCTGTGCAAGAACGTGAGCACCGTGCAG
TGCACCCACGGCATCCGCCCCGTGGTGAGCACCCAGCTGCTGCTGAACGGCAGCCTGGCCGAGGGCAAGGTGATGATCCGC
AGCGAGAACATCACCAACAACGTGAAGAACATCATCGTGCAGCTGAACGAGACCGTGACCATCAACTGCACCCGCCCCAAC
AACAACACCCGCAAGAGCGTGCGCATCGGCCCCGGCCAGACCTTCTACGCCACCGGCGACATCATCGGCGACATCCGCCAG
GCCCACTGCAACGTGAGCGGCAGCCAGTGGAACCGCGCCCTGCACCAGGTGGTGGGCCAGCTGCGCGAGTACTGGAACACC
ACCATCATCTTCAAGAACAGCAGCGGCGGCGACCTGGAGATCACCACCCACAGCTTCAACTGCGGCGGCGAGTTCTTCTACT
GCAACACCAGCGGCCTGTTCAACAGCAACTGGACCCACAACGACACCGCCAGCATGAAGCCCAACGACACCATCACCCTGC
CCTGCCGCATCAAGCAGATCATCAACATGTGGCAGCGCGTGGGCCAGGCCATCTACGCCCCTCCCATCCAGGGCGTGATCCG
CTGCGAGAGCAACATCACCGGCCTGATCCTGACCCGCGACGGCGGCGGCAACATCAACGAGAGCCAGATCTTCCGCCCCGG
CGGCGGCGACATGCGCGACAACTGGCGCAGCGAGCTGTACAAGTACAAGGTGGTGCGCATCGAGCCCCTGGGCGTGGCCCC
CACCAAGGCCAAGCGCCGCGTGGTGGAGTAA (SEQ ID NO:16)

FIG. 38